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EDITORIAL

OUR HERITAGE.

The centennial observance of the founding of The Philadelphia College of Apothecaries, the initial movement in America looking toward the education of pharmacists, calls not only for retrospection, but likewise for earnest reflection. No man may know what the future has in store, or what the future may bring forth as the fruits of the labor of his day. It is, however, possible for each generation to build upon a foundation of good example that may prove an inspiration to others, and an incentive to a higher development of the vocations in which their labors are directed.

As we study the events and the work of the principal characters associated with this important occurrence in the history of pharmacy, we are impressed with the unselfishness of their labors, and the high ideals and motives that prompted and directed their course, and we are inspired with respect and reverance to their memories. It is evident the philosophy of service is not an exclusive doctrine of the present generation.

The history of The Philadelphia College of Pharmacy is one of continuous striving to uphold and upbuild the ethics of pharmacy, and the planting of new milestones along its course of progress. The founders planted better than they knew, and as a result of their labors and sacrifices and the continued service of those who followed in their foot steps, there is now dedicated not only a proper basic foundation but a superstructure that has been carefully erected as representative of ethical pharmacy.

Surely we have no mean heritage. Yet, with this heritage, we must appreciate that to the present generation there has come responsibilities. The torch of progress and of service now in our hands must be passed on to succeeding generations with augmented

knowledge, strength and brighter prospects. It is ours not only to preserve, but to deserve still greater results. We cannot live and work for self alone. The sacrifices and exemplary labors of our illustrious predecessors make it a compelling duty to sustain and carry on the work so well begun.

Upon the graduates of this old school, there is a special responsibility to maintain its prestige; to husband its strength; to support its ideals and labors, both by moral and material support. Who can estimate the value of the instructions that he has received within the walls of this old instituton, or measure the effect thereof upon his professional and business career or to what extent his success in life is attributable to the sound principles regarding the commercial and professional dealings with his fellow men that were inculcated by these teachers? Thus each Alumnus must engage in conscientious reflection upon his own debt to his Alma Mater.

Not only have the Alumni of The Philadelphia College of Pharmacy cause to be thankful for the inauguration of The Philadelphia College of Pharmacy and its labors of the past one hundred years, but every branch of the drug trade, and every druggist throughout this broad land has benefited by its teachings and contributions to pharmacy. Its foundation was at a critical period when the action that was forstalled would have indefinitely subordinated the practice of pharmacy to that of medicine. Its influences have radiated far beyond its own class rooms. The scientific works that have emanated from its faculty, the knowledge that has been transmitted through its publications, its work in behalf of the U. S. Pharmacopœia and the National Formulary, and its interest in the improvement of the professional practice of pharmacy have spread over the entire globe.

The Philadelphia College of Pharmacy and Science is now completing its first one hundred years of continuous service in behalf of pharmacy. On the threshold of another century it is presenting well-defined and comprehensive plans for the future developments. It is apparent that the vision of the forefathers is to be duplicated by a still broader vision demanded by the commanding position and the conditions of the time under which it is entering upon its second century. With confidence its management asks for renewed pledges of support from Alumni and friends, so that these plans may be carried to consummation in keeping with the heritage that was ours.

ORIGINAL PAPERS

THE CENTENARY OF PHARMACEUTICAL EDUCATION IN AMERICA.

By George M. Beringer, A.M., Ph.M.

Upon the occasion of the one hundredth anniversary of an important event in the history of a nation or of an organization, it is appropriate that a more comprehensive retrospect be taken than that usual at the intervening annual commemorations. The founding of The Philadelphia College of Apothecaries on February 23, 1821, the first pharmaceutical society to be organized in the New World, had a broader significance than was foreseen at that time. The history of this College is of vital importance to pharmacy. As the pioneer in pharmaceutical education it has had an incalculable influence in deciding the ideals of the profession. It has been a potent factor in determining the systematic collegiate education of pharmacists, and the influence radiating from its halls have been exemplary and of untold benefit to the various branches of the drug trade, as well as to the strictly professional work of the pharmacy.

On the centennial of such an important pharmaceutical event, our thoughts naturally turn to a review of the political and social conditions existing at the time, both in America and in Europe; the acts and influences that led up to the establishment of a college for the tuition of pharmacists, and to those who were the active and guiding spirits in this movement.

Europe and America alike had but recently had a surfeit of war. The Napoleonic campaigns had affected the integrity of the European countries, and the Holy Alliance had but recently been formed to support the second treaty of Paris and to secure permanent peace in Europe. To the South, the Spanish Colonies were fighting their mother country for independence, and the Central American and the South American Governments were being established.

The Anglo-American War of 1812-15 more firmly established our own Federal Government and clearly defined the attitude of

the United States against all foreign aggression. What was even more apparent at this time was the spirit of our people; the determination that we were to become one of the foremost peoples of the world; that the abundant natural resources and the fertility of our soil should be applied to the end of developing our industries and national strength. Soon after the close of this war, and as a logical sequence thereof, arose the cry for financial and industrial independence from England, and this was the period of the inception of what has been referred to as "The American Policy" —"The Protective Policy." The foremost advocate at the time was A. J. Dallas, a Democrat of prominence and a former Secretary of the Treasury.

Our country experienced the usual aftermath of war, speculation was rife, state banks were established everywhere and with the usual result the inordinate bubbles burst and brought on a panic. Eighteen hundred and nineteen is said to have been a hard year, and farms were sacrificed, factories were closed, and Philadelphia was crowded with men out of employment. At that time Philadelphia was the chief city in America, not only in numbers, but likewise in financial, commercial and educational facilities. This period of our national history has been termed as the Period of Great Beginnings. The national ambition was a powerful incentive for many of the schemes for the development of our country, and Philadelphia was the center from which many of these can be traced.

The chartering of the Bank of Pennsylvania in 1816, for twenty years with the financial backing of Stephen Girard and other active financiers of the day, was an influential factor in encouraging many of our industries and public utilities. The first two years of its existence, like its predecessor, the first Bank of the United States, this bank was domiciled in Carpenters' Hall. Canals, railroads, turnpikes and bridges were among the leading public projects inaugurated, and the importance of transportation to the development of our country was thus recognized and claimed prime consideration. One of the feats of transportation of these early days was the bringing of coal by "arks" down the Lehigh and Schuylkill Canal to Philadelphia.

Eighteen hundred and twenty marks also a renaissance in the sciences, literature and arts. The old theories, such as the phlogistic theory in chemistry, that had so long hampered scientific

progress, had about run their courses, and now more rational ideals prevailed that laid the foundation for the great advance of the succeeding century in physical, chemical and in natural sciences. This was the time of the extension of scientific pursuits and the organization of scientific societies in America. Likewise, was it the time when new industries were being organized in every direction, and our artisans were becoming more skilful and ingenious. Education was claiming its due share of attention and schools and colleges were being instituted in various sections of the country. The foundation for a distinctive American School of Literature was being laid.

The year 1821 commences a new era in the history of pharmacy. Samuel F. Troth, in 1864, gave the following word picture of the condition of the practice of pharmacy at this time and the dependence of the early drug trade upon foreign sources of supply.

"Epsom salts was very little used when I was an apprentice; we used to purchase from 20 to 40 pounds of Glauber at a time, at 2¼ cents per pound, while we would only buy a single keg of Epsom, holding about 25 pounds, at 15 cents. The first really nice Epsom salts I recollect having in our store, was the year the College was organized; John Farr, the noted chemist, was going to pay a visit to his friends in London, and offered to make some purchases for us, and one of the articles in that first importation of our house was two casks, 1190 pounds of beautiful Epsom salts, at a cost here of 7 cents per pound, which was so much in demand by the retailers that we increased our orders, until the Baltimore manufacturers put a stop to our importations of the article. Super, carb. soda, which has been such a common and universally used article of later years, was hardly ever seen when I was learning the business; I think the first we had in our store, was purchased from Farr & Kunzie at $1.25 per pound, in 1821, when we paid them the same price for tartaric acid.

"I attended the first and second courses of lectures of this Institution, and should have applied for the diploma had there been any such prize to have been obtained, but the College did not even decide upon the form of a diploma until I had been in business for myself between three and four years.

"Forty years ago, all the calcined magnesia we sold was burned in Abram Miller's pottery, opposite this building, where the public school now stands; we used to take a case of English carb. magnesia, pick out some of the nicest and hardest lumps, and pack the balance in earthen crocks procured from the pottery, and send them around to be put in the kiln when Miller burned his ware."

During the Colonial period, the several branches of medicine were conducted in a rather primitive style. The population was

largely rural and scattered over a wide area in this sparsely settled country along the Atlantic seaboard. The prevailing good health of the early settlers, and the custom of each family to have its collection of medicinal herbs and household remedies, which were employed in the home treatment of the simpler ailments, made the services of the physician needed only in extreme illness, epidemic or accident. The physicians in this period were a rather heterogeneous lot, some practicing medicine only as a portion of their life vocation. Most of these had only served an apprenticeship with some older physician, and by preparing the medicines he dispensed, observing his methods and studying under his guidance had completed the time of their indenture, and his certificate of proficiency was the only license to practice required. Some few, with higher aspirations, pursued their medical studies further in the European schools of medicine for the purpose of obtaining a diploma. The number of these better qualified physicians were augmented from time to time by a few educated medical men who immigrated from abroad. A writer states: "In those days any one who knew jalap from ipecac or Calomel from Tartar Emetic, and had the assurance to use them at his option, to make and apply ointments and plasters, to dress wounds, to splint a broken limb, was a welcome settler and received without asking the title of doctor.

In this primitive condition of the medical practice, the art of the apothecary was not recognized, and the dispensing of medicine was vested in the physicians. With the development of the Colonies and the growth of their commerce, the establishment of chemist stores and apothecary shops became more general. Many of the apothecaries were recruited from those who had served as apprentices to the physicians. The industrial and educational progress that had been made by the first quarter of the Nineteenth Century resulted in a stricter specialization in the arts, trades and professions, and this was reflected to some extent in the practice of the drug trade. The time had fully arrived for divorcing the art and practice of pharmacy as a distinct branch of medicine. The evolution of medicine had progressed to the state where a sufficient number of physicians realized the necessity and advocated dissociation as the proper line of progress.

Every event is the direct outcome of some pre-conceived teach-

ing and the attempt of some influential person or body of men to affect action in accordance therewith. With the result in evidence, it is usually easy to trace back to the original source the doctrines and theories from which the event sprung.

The institution of The Philadelphia College of Apothecaries was not a spontaneous occurrence of the time but was foreshadowed by a series of arguments and teachings promulgated since 1765. In that year Dr. John Morgan, returning from Europe, where he had assiduously applied himself to the study of medicine in London, Edinburgh and Paris, joined with Dr. Wm. Shippen, Jr., in founding the first medical school, the Medical School of the College of Philadelphia.[1]

In his "Discourse Upon the Institution of Medical Schools in America," delivered at the commencement of the College of Philadelphia, May 30-31, 1765, he publicly advocated the introduction of the regular mode of practicing physic in Philadelphia.

As a graduate of the College of Physicians of Edinburgh, he had subscribed to its code of ethics adopted in 1754, which prohibited their fellows and licentiates "from taking upon themselves to use the employment of an apothecary, or to have and to keep an apothecary shop."[2]

Bringing back from Europe this advanced idea, Dr. John Morgan, as the first Professor of Theory and Practice of Physic in America, boldly championed the principle that medical men henceforth should confine themselves to prescribing, leaving to the apothecary the preparing and compounding of medicines. He consistently advocated the dissociation of surgery and pharmacy from the practice of medicine proper, and in this initial address argued:

[1] The medical department of the University of Pennsylvania was established in 1779, and in 1791 these two medical schools, by act of the Legislature, were united under the University of Pennsylvania.

[2] This action was an attempt to reform the practice of medicine as carried on in Great Britain in accordance with the law enacted in 1511, by which the right to practice medicine in England was vested in the "faculty of medicine," who were privileged to practice medicine, surgery and pharmacy. The apprentices and assistants of the medical practitioners were termed "Apothecaries." Their functions were the dressing of wounds, extracting of teeth, bleeding and preparing the medicines and compounding the prescriptions of their preceptors. In the American Colonies, this custom of the Eng-

lish practitioners had been followed and continued until the initiation of the dissociation movement advocated by Dr. Morgan.

DR. JOHN MORGAN

"We must regret that the very different employment of physician, surgeon and apothecary should be promiscuously followed by any one man. They certainly require very different talents.

"The business of pharmacy is essentially different from either, free from the cares of both, the apothecary is to prepare and compound medicines as the physician shall direct. Altogether engaged in this, by length of time he attains to that skill therein which he could never have arrived at were his attention distracted by a great variety of other subjects.

"The wisdom of ages approved by experience, the most certain test of knowledge, has taught us the necessity and utility of appointing different persons for these different employments, and accordingly we find them prosecuted separately in every wise and polished country.

"The paying of a physician for attendance and the apothecary for his medicines apart, is certainly the most eligible mode of practice both to the patient and practitioner. The apothecary, then, who is not obliged to spend his time in visiting patients, can afford to make up medicines at a reasonable price, and it is as desirable as just in itself that patients should allow fees for attendance—whatever it may be thought to deserve.

"They ought to know what it is they really pay for their medicine and what for medical advice and attendance."

While in Europe he wrote, "I am now preparing for America, to see whether after fourteen years' devotion to medicine I can get my living without turning apothecary or practitioner of surgery." It is apparent that this erudite and accomplished medical leader of the time had a clear vision of the proper field to be occupied by the co-ordinate branches of medicine, and that the process of the evolution of medicine and the dissociation of these branches in America can be traced to his early teaching.

In the announcement of the opening of the first medical school appeared this succinct statement, "In order to render the course of

lectures the more extensively useful it is intended to introduce into them as much of the theory and practice of physic, of pharmacy and chemistry as can be consistently admitted." Dr. Morgan had served his apprenticeship with Dr. John Redman, and in this capacity doubtless he had been the apothecary apprentice of this popular physician, and subsequently he had served for thirteen months as apothecary at the Pennsylvania Hospital, so that he was qualified to instruct in this branch.

In 1789, Dr. Samuel P. Griffith was appointed Professor of Materia Medica and Pharmacy, and after the consolidation of the College of Philadelphia with the University of Pennsylvania in 1791, Dr. Griffith continued this same chair and under the same title. The teaching of pharmacy, as a distinct branch, however, was not considered. The University teaching was confined to that considered necessary to the practicing physician. There was, however, alive though dormant, the precepts instilled by Dr. Morgan as to the necessity for a special education for those who intended to follow the vocation of apothecaries. Dr. Joseph Carson, in the history of the Medical Department of the University of Pennsylvania states, "The course pursued by Dr. Morgan may be said to have given the original impulse to the cultivation of the profession of pharmacy and sanctioned its independent existence."

Possibly the condition of the drug trade at this time, and the lack of control over the quality of medicines, and the agitation that had been made over the appearance of a lot of spurious opium and other adulterated drugs on the market had much to do with awakening the public interest, and directing the attention of the University of Pennsylvania authorities to the apparent need for collegiate education of pharmacists.

At a meeting held on August 3, 1819, the trustees decided that the teaching of the pharmaceutical art should be a part of the duties of the Professor of Materia Medica and Pharmacy, and that a course of lectures should be established intended for pharmaceutical students. At a meeting held on February 6, 1821, as a further step, the trustees determined that the degree of "Master in Pharmacy" should be conferred upon pharmacists who had served an apprenticeship of at least three years with a respectable apothecary and passed an examination before the Professors of

Materia Medica, Chemistry aid Pharmacy.[3] But, hereafter it shall be requisite for obtaining the degree that the candidates shall have attended at least two courses of lectures on chemistry, materia medica and pharmacy in the University.

The seed sown by Dr. John Morgan was now beginning to bear fruit, and pharmacy is very largely indebted for its position as an independent branch of the medical profession to the discerning wisdom of this earnest advocate for the pure practice of physic. It is to the credit of the medical faculty of the University of Pennsylvania that they recognized that the duties of the apothecary were distinct from those of the medical practitioner, and that pharmacists need a special collegiate education. The trustees were convinced that the time had now come for the inauguration of a systematic and scientific education for pharmacists.

That this action was both timely and wise cannot be questioned, nevertheless, this project of the University looking toward the establishment of a school for pharmacists aroused the latent energy and the dormant pride and self-respect of those most directly interested in the needs and requirements of the drug trade. The opposition became more pronounced as it was more thoroughly discussed. The conferring of this degree by the University upon sixteen of the apothecaries of the city but added fuel to the dissatisfaction and the advertisement of this degree by some of the recipients was to the disgust of their competitors. The pharmacists were compelled to realize that the time had come when a plan must be adopted for the systematic education of those who wished to follow the profession of pharmacy.

It is narrated that Peter K. Lehman, one of the old school of Philadelphia druggists, whose store was located on the south side of Market Street, below Tenth Street, went to Henry Troth, then engaged in the wholesale drug trade on Market Street, below Seventh, and giving vent to his sentiments, indignantly declared, "Henry, this won't do." This gave rise to the inquiry, "Why can't

[3] The minutes of the University of Pennsylvania disclose that the action of the University was the outcome of a letter from Professor John Redman Coxe, on March 7, 1820, suggesting the propriety of granting licenses, after examination, to apothecaries.

we have an institution of our own, train our own apprentices and ourselves supervise the qualifications of those seeking admission to our ranks?" It is told that they concluded that this was a feasible idea, and they proceeded to call on those engaged in the wholesale and in the retail drug trade and presented their suggestion.

PETER K. LEHMAN

The intensity of the opposition to the project of the University, and the favorable acceptance and of the new idea was quite evident. A meeting of the druggists and apothecaries of the City and Liberties of Philadelphia was called to meet at Carpenters' Hall, on February 23, 1821. At this meeting, Stephen North was called to the chair and Peter Williamson was appointed Secretary. The resolutions adopted by the Board of Trustees of the University at their recent meeting had been printed in Poulson's *American Daily Advertiser*. These were read and resolutions offered by Henry Troth were adopted. These objected to the University instituting a school of pharmacy, and set forth that the method proposed by the trustees of that body was not suited to correcting the alleged abuses in the drug and apothecary business. A committee of nine was appointed to consider the subject and report on a proper mode of procedure at a subsequent meeting. This committee, remarkable for the personnel and the ability of its members, consisted of Samuel Jackson, Daniel B. Smith, Robert Milnor, Peter Williamson, Stephen North, Henry Tröth, Samuel Biddle, Charles Allen and Frederick Brown.

The second meeting was held on March 13, 1821, and the minutes record that this committee made a report setting forth that abuses had occurred of deteriorated drugs being introduced into the shops; and valuable remedies in daily use being adulterated

and sold of inferior quality; such abuses, attributable in part to want of proper pharmacological information on the part of some druggists and apothecaries who vended and physicians who buy, had attracted the attention of those interested in the proper conduct of the trade, and had led to some druggists and apothecaries at the suggestion of one of the faculty of medicine of the University, to direct the attention of the trustees to the subject, in consequence of which they have taken the action reported at the previous meeting. It was, however, apparent that the measures proposed by the University were not well adapted to correct existing irregularities, which could be best remedied by the interposition and active agency of the druggists and apothecaries themselves.

CARPENTERS' HALL IN 1821

To this end, the foundation of The College of Apothecaries was recommended, the attention of which will be constantly directed to the qualities of articles brought into the drug market, in which subjects relating to their business and its objects can be discussed, and information beneficial and instructive to the trade communicated. It was recommended that a school of pharmacy

be erected, in which lectures designed especially for the instruction of druggists and apothecaries should be delivered.

A Constitution and By-laws had been prepared by the committee, and this was approved and signed.

The following sixty-eight names of representative druggists and apothecaries composed the list of charter members:

Charles Marshall,	Thomas Cave,
Stephen North,	Joseph Allen,
John Elliott,	Thomas Wiltberger,
William Lehman,	Isaac Thompson,
Charles Allen,	Matthias Pleis,
Jeremiah Morris,	George Babe,
Robert Milnor,	Jacob Bigonet,
Peter Lehman,	P. Thompson, Jr.,
Samuel Jackson,	William C. Poole,
Elisha Crowell,	Henry Troth,
James W. Simes,	Peter Williamson,
William Rovoudt,	Warder Morris,
Mordecai L. Gordon,	George H. Burgin,
William Heyl,	Frederick Klett,
John P. Wetherill,	Edward B. Garrigues,
Edmund Pryor,	Frederick Brown,
Thomas M'Clintock,	Caleb Ash, Jr.,
George D. Wetherill,	Wilson Jewell,
Thomas Oliver,	Charles Ellis,
William Baker,	Jeremiah Emlen,
Thomas A. Mason,	John I. Smith, Jr.,
Richard Jordan,	George Glentworth,
James L. Smith,	Edward Lowber,
Alexander Fullerton, Jr.,	Charles Thompson,
Algernon S. Roberts,	Charles Wetherill,
Solomon Temple,	Charles Yarnall,
Edward Needles,	Daniel Thatcher,
Daniel B. Smith,	Daniel Elliott,
Samuel Biddle,	Charles Treichel,
Eleazer Cohen,	Samuel P. Wetherill,
Charles Marshall, Jr.,	Thomas Evans,
James S. Ewing,	Henry M. Zollickoffer,
A. Eckey,	Charles Rizer,
Daniel Laws,	Anthony H. Morris.

Two weeks later the first stated meeting was held, and the following officers were elected:

President: Charles Marshall.
Vice-Presidents: William Lehman, Stephen North.
Treasurer: William Heyl.
Secretary: Daniel B. Smith.

BOARD OF TRUSTEES:

Samuel P. Wetherill,	Charles Marshall, Jr.,
Dr. Samuel Jackson,	Warder Morris,
Daniel Elliott,	Peter Williamson,
Charles Allen,	Daniel Thatcher,
Henry M. Zollickoffer,	Samuel Biddle,
Jeremiah Morris,	Thomas M'Clintock,
Henry Troth,	Frederick Brown,
Peter Lehman,	Thomas Wiltberger.

The history of pharmaceutical education and of pharmaceutical progress in the Western Hemisphere dates from these meetings held in Carpenters' Hall in February and March, 1821. Thus was established the first College of Pharmacy in America, the pioneer whose precepts and examples have been closely followed by many schools of pharmacy subsequently instituted.

Sacred are the memories associated with Carpenters' Hall. It holds second place only to Independence Hall as a place of meeting in which transpired events of the utmost importance in shaping the destiny of this nation. It was erected in 1770, by the Association of Master Carpenters of Philadelphia—"The Carpenters Company." Within its halls the first Continental Congress convened on September 5, 1774, and fifty-five men picked as representatives of the Colonies met and were thrilled by the eloquence of Patrick Henry, and guided in their deliberations and the framing of the Declaration of Rights, by such counsellors as Jefferson, Adams and Washington.

It is indeed a happy coincidence that pharmaceutical education in America had its birthplace in such a hallowed spot and, as pharmacists, in addition to our patriotic reverence for the historical building and its associations, we can with just pride look upon the meetings of the druggists and apothecaries in Philadelphia, one hundred years ago, as the declaration of rights of pharmacy and its professional independence.

As we look over the list of the founders and first officers of the College, we are impressed that it is an exceptional list of names and that many of these were men of more than usual ability and social standing who performed noteworthy services in their calling and likewise in public affairs. Our narrative of the occurrences associated with the institution of The Philadelphia College of Pharmacy would be incomplete without reference to the dominating spirits of these meetings.

Stephen North, who presided at the first meeting of the Apothecaries held in Carpenters' Hall, was second Vice-President of the College from 1821 to 1824, and first Vice-President from 1824 until the time of his decease in 1826. He was a worthy wholesale druggist, doing business at 14 North Second Street (old number), a few doors south of Christ's Church. Shortly before his death he removed to the northeast corner of Sixth and Market Streets.

Charles Marshall, the first President of the College, was the youngest son of Christopher Marshall, the "fighting Quaker," whose Diary of the Revolution, or "Remembrancer," is a Philadelphia classic, accepted as a valuable record of events of those stirring times and of the prominent participants. Christopher Marshall was born in Dublin, Ireland, November 6, 1709, and after emigrating to America, was for some years a resident of Bucks County, Pa., and a member of the Middletown monthly meeting. He first established himself in business in 1729, at Front and Chestnut Streets. In 1735, he purchased a property on the south side of Chestnut Street, above Second Street, where he opened an apothecary shop which was considered the most complete this side of New York City, and possibly the earliest of its type in the City of Philadelphia. Suspended over the projection of the gable roof on Chestnut Street was a large gilded ball, and the store was commonly known as the "Golden Ball."

CHARLES MARSHALL

In 1765, two of his sons, Christopher Marshall, Jr., and Charles

Marshall, were taken into partnership. In 1772, he withdrew from active participation in commercial matters, but, for years thereafter, continued to take an active interest in public affairs. Because of his militancy, he was expelled from membership in the Orthodox Society of Friends, and became one of the founders of the "Free Quakers." He was active in the movements in opposition to the aggressions of the Crown, and was a member of many of the Citizens' Committees appointed in connection with these movements. It is recorded in the *Congressional Record* that in 1776 Christopher Marshall of Philadelphia, the well-known druggist and much-respected member of the Society of Friends, was commissioned to look after the needs of the sick and wounded in the hospitals of Philadelphia.

Charles Marshall was born in 1744, and was well educated in the branches then taught, including Latin and Greek, and was possessed of a fine literary taste. He learned the drug business with his father, and was well qualified to conduct a drug store. He became the active manager of this business, his brother, Christopher Marshall, Jr., devoting a large portion of his attention to the shipping business, in which the brothers were associated in partnership with their older brother, Benjamin.

The enviable reputation of the Marshall Drug Store, established by the father greatly increased, and a laboratory for the boiling of oils and the manufacture of Ammonia Salts and other chemicals was established on North Third Street, near the stone bridge over the Cohocksink Creek. This firm supplied large quantities of medicines to the Colonial troops; those of Pennsylvania, New Jersey, Maryland, Delaware and Virginia obtained their medical supplies almost entirely from this store.

In 1801, Charles Marshall retired from active participation in the business. The firm continued, but did not confine its activities to the drug business alone, and in a few years became insolvent, by reason of loaning its endorsement, and involved all connected with it in bankruptcy. This was a sad blow to Charles Marshall, and on May 30, 1805, he addressed this letter to the Philadelphia monthly meeting, explaining his financial embarrassment:

> "Altho my prospects be thus gloomy with respect to outward things, yet I am at times favored with a sustaining hope that He, whose mercies are over all His works, will not be altogether unmindful of Your afflicted Friend."

His eldest daughter, Elizabeth Marshall (1768-1836) now became the proprietress of the drug business founded by her grandfather some seventy years before, and under her able management, the business continued to increase, and was placed upon a firm financial basis. Probably she was the first woman in Philadelphia to embark upon a commercial career upon such an extensive scale, and she was the first American woman pharmacist of whom we have any knowledge. She continued to manage this business until 1825, when it was transferred to two of the apprentices, Charles Ellis and Isaac P. Morris.

ELIZABETH MARSHALL

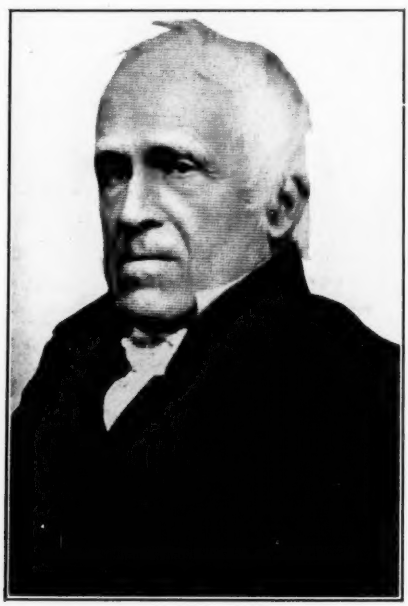
When the Philadelphia College of Apothecaries was founded in 1821, despite his advanced years, Charles Marshall was chosen President of the institution. For several years he gave the College his active interest and support. In 1824, by reason of the infirmities of his age, he resigned.

William Lehman was the first Vice-President of the College, serving in that capacity from 1821 to 1824. Upon the resignation of President Charles Marshall, he was elected to that office, and filled this position from 1824 to 1829. He was a cousin of Peter Lehman, one of the inaugurators of the movement that resulted in the founding of the College. He was educated in the University of Pennsylvania, graduating therefrom in both the literary course and in medicine, but he preferred to engage in the drug business with his father instead of practicing medicine. About 1802 he opened his own apothecary store at 97 South Second Street, and a few years later removed to 76 South Second Street (old numbers) below Chestnut Street. Here he was associated for awhile in partnership with William Smith, and later with Algernon S. Roberts. His father left him a moderate fortune, which he greatly increased by his efforts in the drug business. Despite the constant application required by the business, he continued to be an extensive reader and student throughout his life. He was a good Latin scholar, a fluent speaker of both French and German, and visited Europe on three different occasions.

He was elected to the Pennsylvania Legislature in 1814, and

was continuously re-elected to represent the City of Philadelphia for fifteen years. He was an earnest advocate of internal communications as the means of increasing the prosperity of his native city. William Lehman never married, he was happy in his devotion to the public causes which he had so much at heart, and gained a host of friends and supporters for these projects and was one of the most useful and eminent public men of his day. He died at Harrisburg on the twenty-ninth day of March, 1829, in the fiftieth year of his age. He left a bequest of $10,000 to the Athenæum of Philadelphia for the purpose of erecting a suitable building, and this became the nucleus of the building fund through which they acquired their new hall, opened on October 18, 1847.

Daniel B. Smith. No history of American pharmacy would be complete without due reference and credit being given to this most learned and public-spirited pharmacist of his day, who was remarkable for the versatility of his attainments. While characterized by a quiet and unostenstatious manner, he was, nevertheless, a happy combination of business man, philanthropist, literary and scientific scholar, teacher, author and editor. In all of these activities he established an enviable reputation, and won the admiration of his contemporaries.



DANIEL B. SMITH

The ancestors of Daniel B. Smith were among those who established the early settlements in Burlington County, N. J. He was the son of Benjamin and Deborah (Morris) Smith, and he was born in Philadelphia in 1792. His father died when he was but one year old, and his mother removed to Burlington, N. J.

His early education was acquired at the school of John Griscom, a highly esteemed educator who maintained a "Friends' school"

in Burlington, and whose reputation attracted scholars from Philadelphia, New York and portions of New England. In the fall of 1808, this Quaker schoolmaster gave a course of lectures on chemistry, and this was the first teaching of chemistry in the common schools of the United States of which we have any record. The influence of a teacher so enthusiastic and endowed with such natural qualifications, and gifted with a conversational ability that was magnetic, must have been a potent factor in deciding the choice of a business career for Daniel B. Smith, which would bring him into close association with scientific studies. After leaving the school, he entered the store of John Biddle on Market Street, between Fourth and Fifth Streets, Philadelphia, to learn the drug busiiess. After completing his apprenticeship, a partnership existed with his preceptor under the firm name of Biddle & Smith for about one year. In 1819, Daniel B. Smith established his own store at the northeast corner of Arch and Sixth Streets. At that time this locality was the quiet, secluded, residential section occupied by many of the prominent members of the Society of Friends.

He was one of the organizers of the Apprentices' Library in 1820, for "the purpose of supplying wholesome instruction and useful reading for boys learning a trade." He was an active, if not the dominating spirit, in the founding of The Philadelphia College of Pharmacy, and was elected Secretary; after serving as Secretary for seven years, he was elected Vice-President in 1828, and President in 1829. For a period of twenty-five years, during a most trying period in the history of the College, he held this position, resigning in 1854.

When the Committee on Publication was appointed in June, 1825, the College having "in contemplation" to publish an occasional journal, containing improvements of formulas, new discoveries, and other interesting pharmaceutical information, Daniel B. Smith was appointed the chairman. When the first number of the journal of The Philadelphia College of Pharmacy [4] appeared in December, 1825, Daniel B. Smith was the editor and the author of the initial original article on "Epsom Salts and Magnesia." To him belongs the credit of having established from its inception, the journal on a high scientific and ethical plane.

[4] Under this title the publication was continued for six volumes; since 1835, it has been published under the more comprehensive name of THE AMERICAN JOURNAL OF PHARMACY.

He contributed a number of the articles to the first edition of the *United States Dispensatory*, and it was the intent of the authors, Drs. Wood and Bache, that he should prepare the pharmaceutical portion, but his removal to Haverford at this time rendered such a program impractical, Dr. George B. Wood publicly recorded his tribute to Mr. Smith's attainments in science and literature, as well as his appreciation of the services he had rendered in behalf of pharmacy.

In 1828, William Hodgson, Jr., who had learned the apothecary business in the store of Jacob Bell in London, became associated with Daniel B. Smith, and the firm of Smith & Hodgson continued to extend their manufacturing and wholesale drug business. A four-story building temporarily met the demands for increased room for manufacturing purposes, and subsequently this firm decided to engage exclusively in manufacturing at their new laboratory that they had erected on Grays Ferry Road, and in 1849 disposed of their drug business to two of their apprentices, Charles Bullock and Edmund A. Crenshaw.

Daniel B. Smith took an active interest in the notable discoveries in physics and chemistry, and repeated many of the published experiments. He became a member of the Franklin Institute soon after its organization in 1824. He was elected a member of the American Philosophical Society in 1829, and was also a member of the Academy of Natural Science. He was one of the inaugurators of the Historical Society of Pennsylvania, and that society's first Corresponding Secretary. He was one of the incorporators of the Philadelphia Savings Fund, and also of the institution known as the House of Refuge.

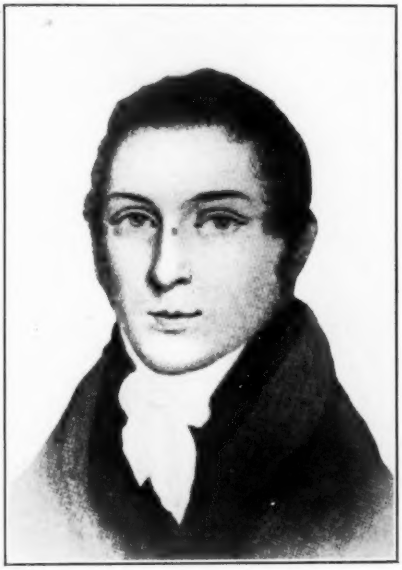
While science and philanthropy claimed much of his time, achievements in the field of general literature were equally attractive. In 1834 he accepted the chair of Moral Philosophy, English Literature and Chemistry in Haverford School (now Haverford College), and removed to Haverford. During his twelve years' residence here, he wrote "The Principles of Chemistry," a text book that went through two revisions. His lectures on "Ethics and the Lives and Doctrines of the Early Members of the Society of Friends" are spoken of as literary productions of great merit.

In 1846 he resigned from Haverford College, that he might give his attention to his increased drug business.

When the American Pharmaceutical Association was organized

in 1852, his prominence and accomplishments were recognized, and he was elected as the first President. He retired from active business in 1853. The last years of his long and useful career were quietly spent at his home in Germantown, where his life ceased on March 29, 1883, in the ninety-first year of his age.

Henry Troth. Henry Troth was born at Woodstock, a plantation a few miles from Easton, Pa. He spent the first thirteen years of his life with his parents. About this time a number of relatives and neighbors moved up to Tioga County, intending to establish a colony in what was then considered a frontier, and the lad persuaded his parents to allow him to accompany the party. He remained with these friends three years, enduring many hardships, learning lessons from the great book of nature, and gaining an education in practical expediency and self-reliance unobtainable from text books. At the age of sixteen, his aspiration for improvement led him to Philadelphia, where he entered upon a five years' apprenticeship with Jeremiah Morris, to learn the drug business.



HENRY TROTH

Here he mastered the many details of the apothecary business, and acquired a fund of useful knowledge and made friends that were of great value in his subsequent business career as a wholesale druggist. He had not quite reached his majority when he formed a partnership with Edward Needles, a brother-in-law, and the wholesale drug firm of Henry Troth & Company was established on Market Street, below Seventh (old number 222). On January 1, 1823, Henry's younger brother, Samuel F. Troth, was admitted to the firm, and on February 1, 1826, Samuel purchased the interest of Edward Needles.

Henry Troth was active in the organization of the College and for more than twenty years thereafter, in its management. For thirteen years he was Vice-President, at a time when the President was seldom in attendance, and presided at the meetings with dignity and impartiality. H was always kind and courteous, and guided by the highest motives. He died on May 22, 1842.

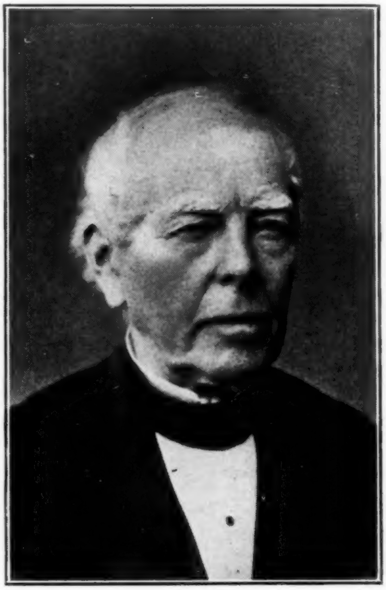
Samuel P. Wetherill. When the Board of Trustees was first organized on March 27, 1821, Samuel P. Wetherill was chosen as chairman. He was a member of the firm of wholesale drug and color dealers located at 65 North Front Street. The Wetherill drug store was established at this location in 1762, and for years had the reputation of being one of the largest dealers in drugs in America. The handling of paints, dyes, glassware and technical chemicals became an important part of their commercial transactions. They were among the pioneers in American chemical manufacture, their original manufacturing laboratory having been established by Samuel Wetherill in 1776. On the site now occupied by The Girard Trust Company, at Broad and Chestnut Streets, Samuel Wetherill built a white lead plant, and the first white lead made in America was in 1804 by Samuel Wetherill & Son. This plant having been destroyed by fire, a new factory was built about 1810, at Twelfth and Cherry Streets.

Peter Williamson. Peter Williamson was one of the original body of druggists and apothecaries who convened in Carpenters' Hall to organize the Philadelphia College of Apothecaries and served as the secretary of that meeting. He was the son of Peter-Jessie and Mary Williamson, and was born in Philadelphia, September 6, 1795. He received his preliminary education at a Friends' Seminary. His inclinations led him to take up the drug business and he engaged with John W. Bryant, whose store was located at Second and Pine Streets, to learn the business.

At the early age of eighteen years, he entered into partnership with Dr. Joseph Klapp, and their store was located at the northeast corner of Second and Almond Streets. Dr. Klapp had an extensive medical practice, and Mr. Williamson possessed a natural adaptation for the apothecary business. The firm was quite prosperous, and for many years this continued as the leading drug store in the old district of Southwark. To accommodate the largely increased retail trade, and their specialty, furnishing of medical supplies to the shipping interests, increased facilities were secured by

erecting a larger store at 710 South Second Street. In 1845, he associated his son, Jessie Williamson, Jr., in the business under the firm name of Peter Williamson & Son. In 1854, the business was sold to Mr. James L. Bispham.

Mr. Williamson also served the College as first Secretary of the Board of Trustees in 1821. In February, 1874, he was elected first Vice-President, but after holding this position for only one year, he resigned on account of his age, and entirely withdrew from active participation in business and scientific pursuits.



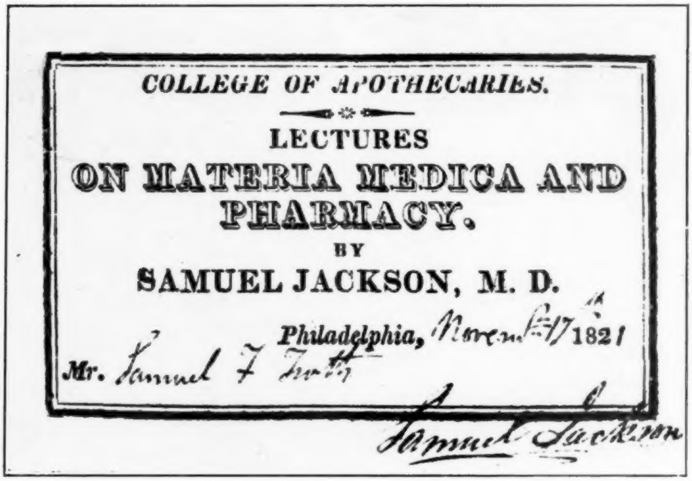
PETER WILLIAMSON

In March, 1874, he founded the first scholarship in the College.

Mr. Williamson was active in Masonic circles; in the old volunteer fire department of the city, and in charitable works. He was one of the corporate members of the Trinity P. E. Church, and for twenty years was Rector's Warden. He passed away at his residence on the 6th of March, 1886, in the ninety-first year of his age.

The first meeting of the Trustees was held in Carpenters' Hall, on March 29, 1821. An organization was effected, with Samuel P. Wetherill as chairman, and Peter Williamson as Secretary, and a committee was appointed to take into consideration the subject of establishing a school of pharmacy, and to draft by-laws for the government of the Board of Trustees. On April 9th, an adjourned meeting of the Trustees was held, at which the Committee on By-laws for the government of the Board presented a draft, which was adopted, and the Committee on the School of Pharmacy reported a plan recommending lectures on Materia Medica and Pharmacy and on Pharmaceutical and General Chemistry. Those on Materia Medica and Pharmacy to be given on three

nights per week, from November 1st to March 1st, and those on Pharmaceutical and General Chemistry from March 1st to June 1st. The price for the tickets for the course on Materia Medica


COLLEGE OF APOTHECARIES.

LECTURES

ON MATERIA MEDICA AND PHARMACY.

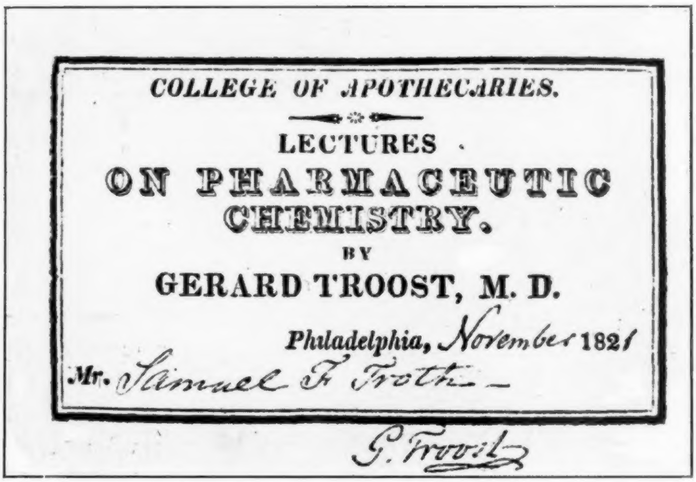
BY

SAMUEL JACKSON, M. D.

Philadelphia, Novem 17th 1821

Mr. Samuel F Troth

Samuel Jackson


COLLEGE OF APOTHECARIES.

LECTURES

ON PHARMACEUTIC CHEMISTRY.

BY

GERARD TROOST, M. D.

Philadelphia, November 1821

Mr. Samuel F Troth —

G. Troost

ORIGINAL LECTURE TICKETS

and Pharmacy was fixed at $15, and for the Chemistry course at $12. In addition a matriculation fee of $5 was to be paid by each student. The lecturers were to receive all of the emoluments from

their respective courses. At a meeting held a week later, the price for the tickets was changed, and it was agreed that for the first course the price was to be $12, and for the second course $10.

The following week, April 23, 1821, Samuel Jackson, M.D., was elected Professor of Materia Medica and Pharmacy, and Gerard Troost, M.D., Professor of Chemistry.

Dr. Samuel Jackson. Samuel Jackson, M.D., the first Professor of Materia Medica and Pharmacy, was born in Philadelphia on March 27, 1787. His father was a druggist, engaged in business on North Fourth Street, and Samuel learned the apothecary business there, and although he had been graduated a Doctor of Medicine from the University of Pennsylvania, he was active in pharmacy at the time of the founding of the College, and became one of its charter members.

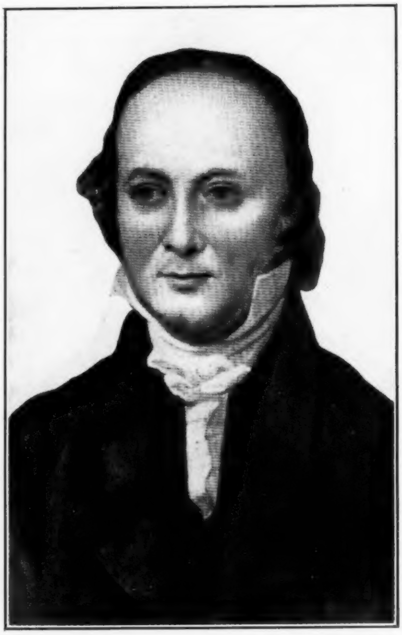
DR. SAMUEL JACKSON

He was eminently fitted for this professorship. His introductory lecture on "Conditions of Medicine in the United States, and the Means to Their Reform," evidenced the high ideals of the lecturer and forshadowed his future successful career as a medical practitioner and teacher.

In 1827, Dr. Jackson resigned his professorship in the College in order to assume a chair in the Medical Department of the University of Pennsylvania, with which institution he was connected as a teacher for thirty-six years. He played no insignficant part in the development of medical education. After his withdrawal from the chair of Materia Medica and Pharmacy, he did not lose his interest in the College of Pharmacy. He served as second Vice-President—1827-1829, and as first Vice-President—1829-1831. He died April 4, 1872, at the age of eighty-five years.

Gerard Troost, M.D., the first Professor of Chemistry, was

educated in Holland, both in medicine and pharmacy. Geology and mineralogy were his favorite studies, but all of the natural sciences claimed his general interest. He was one of the founders of the Academy of Natural Sciences, and its first President. He likewise held the position of Mineralogist to Peal's Museum, a famous collection of natural objects, paintings and curiosities of many kinds, at that time exhibited on the second floor of the State House, over Independence Hall, and afterwards in the Arcade on Chestnut Street, above Sixth, where it was for many years one of the places for sightseers in Philadelphia. The class was small, and despite his scientific attainments, Prof. Troost lacked ability as a teacher and failed to interest his students in his subjects. This was largely due to his foreign accent, which made it difficult for the students to understand him. He served the College as professor for one year only, and later was elected Professor of Chemistry, Geology and Mineralogy in the University of Nashville, and his valuable reports as a State Geologist of Tennessee are considered the best works of his life.



DR. GERARD TROOST

On July 22, 1822, Dr. George B. Wood was elected Professor of Chemistry to fill the place made vacant by the resignation of Prof. Gerard Troost, and served the College in this capacity until 1831, when he was transferred to the chair of Materia Medica and Pharmacy, made vacant by the decease of Dr. Benjamin Ellis.

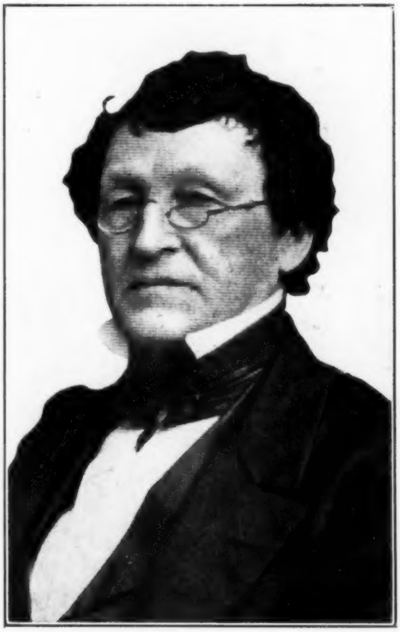
The following copy of the letter written by Dr. Wood to his mother soon after his appointment to the chair of Chemistry, the

original of this letter is preserved in the College of Physicians and Surgeons.

"Philada., 8th mo. 19, 1822.

"My dear Mother,

"Thee wishes to know something about my professorship. The Apothecaries of the city, the most respectable of them at least, have united to establish an institution for the instruction of their apprentices in the principles of their business and have obtained a charter from the state legislature, under the name of the *College of Pharmacy*. In this College there are two professorships, one of Materia Medica, the other of Chemistry—to the last of which I was chosen on the 23rd of last month by a vote of 11 out of 15 Directors. I shall deliver a course next winter to commence on the 1st of November and expect to have about 30 apprentices to attend, with, perhaps, some others. I calculate that the place will be worth to me at least 200 dollars. The preparation of this course is one thing that has been occupying a good deal of my time lately, etc., etc.



DR. GEORGE B. WOOD

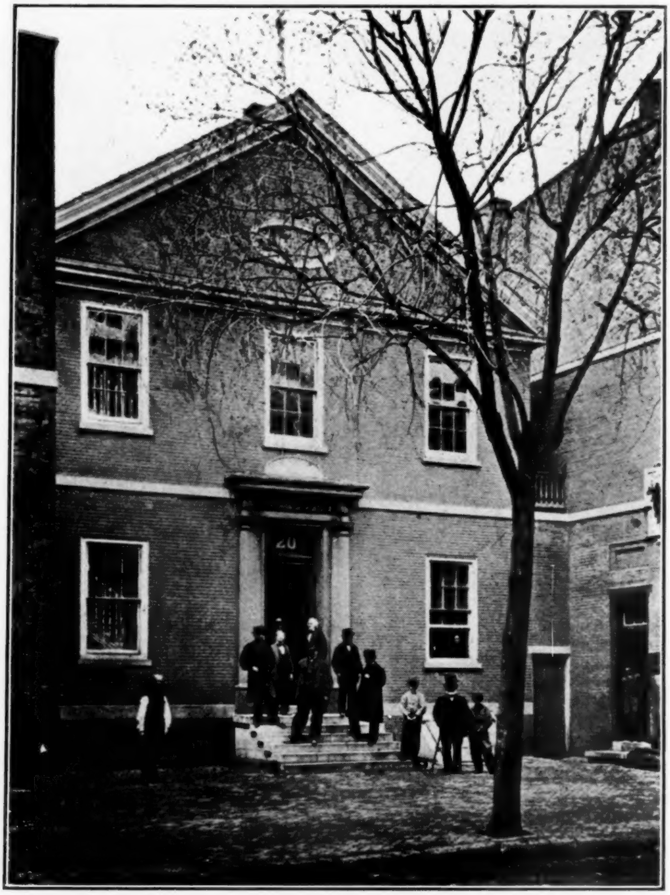
"Thy affectionate son,

"Geo. B. Wood.

"To Elizabeth Wood,
"Greenwich,
"Cumberland Co.,
"New Jersey."

The services of Dr. Wood in behalf of pharmaceutical and medical education belong to a subsequent period in the history, and we must reserve treatment of this subject for another occasion.

There still remained the selection of a suitable place for giving the instructions, and on July 23, the Board authorized the renting of the German Hall, situated on the west side of Seventh Street, south of Market, for lecture purposes, at an annual rent of $200. This was the first home of the College, and instructions were given here until 1833.



GERMAN HALL

In Poulson's *American Daily Advertiser,* Monday, October 29, 1821, appeared the following advertisement:

College of Apothecaries

In the division of the sciences that characterizes the philosophy of the present age, and which has so much tended to their improvement, Pharmacy has been withdrawn from the charge of the Physician, and consigned to the care of the Apothecary. In Europe, this division has long been recognized and sanctioned by the Medical Profession. Colleges of Apothecaries, and other similar institu-

tions, have been established, devoted expressly to instruction in Pharmacy and its subsidiary sciences. On the continent, most of the respective governments have prohibited, under heavy penalties, any one from selling or preparing Drugs and Medicines for administration, who has not passed through a course of instruction, and become practically acquainted with the business. In Great Britain, most Apothecaries are regularly instructed, by attendance on the lectures of the Colleges of Apothecaries of London and Dublin, and are associated as members, while abuses in the business are guarded against by severe penalties, enacted by Parliamentary statute.

In this country, Pharmacy has been entirely neglected, as a science. Previous instruction has not been considered indispensable, in order to capacitate an Apothecary for pursuing his profession, while very few practitioners of Medicine possessed more than a superficial acquaintance with the principles and details of Pharmaceutic knowledge. From this state of things, many evils, some of a serious and aggravated nature, have flowed, urgently requiring correction.

Many Apothecaries of this city have long been sensible of the necessity of taking some efficient measures, by which the irregularities and abuses that have crept into their business, should be abolished; and that their profession should be placed on that respectable footing to which it is entitled, by its usefulness to society, and as an important branch of the science of Medicine. With these views, they have founded the PHILADELPHIA COLLEGE OF APOTHECARIES.

This institution has already established many wholesome regulations for the government of its members, calculated to inspire confidence in all those who are attached to it; and has provided for a course of public instruction, under its auspices, in Materia Medica and Pharmacy, and Pharmaceutical Chemistry, with the intention of adding, ultimately, other collateral sciences. A Cabinet is also forming, of choice and selected specimens of Drugs and Medicines, of the best qualities.

An institution embracing so many objects of high importance and utility to the Medical Profession, and the public generally, and so well calculated to perfect those objects, cannot fail to meet the approbation and support of the liberal and well-informed practitioner, and every member of society.

The College announces, that the Course of Lectures will com-

mence in the first week in November, and will be delivered three times a week, in the evening, during the winter, in the Hall of the German Society, south Seventh Street.

Lectures on Materia Medica and Pharmacy, by DR. SAMUEL JACKSON.

Lectures on Pharmaceutic Chemistry, by DR. GERARD TROOST.

By order of the Board of Trustees.

PETER WILLIAMSON, *Secretary.*

And in Poulson's *American Daily Advertiser,* Tuesday, November 6, 1821, the following:

PHILADELPHIA

COLLEGE OF APOTHECARIES

The Introductory Lecture to the course on Materia Medica and Pharmacy, will be delivered by SAMUEL JACKSON, M.D., on Friday evening, November 9th, in the German Society's Hall, in South Seventh Street, between Market and Chestnut; and

The Introductory Lecture, to the course of Pharmaceutic Chemistry, will be delivered by GERARD TROOST, M.D., on Saturday evening, November 10th, at the same time and place.

On March 21, 1822, at the suggestion of William Lehman, a resolution was adopted, changing the name of the College to a more appropriate title, The Philadelphia College of Pharmacy, and under this name it was incorporated on March 30, 1822.

During the early part of 1829, the German Society, desiring the rooms occupied by the College, and the members feeling that the time had now arrived when the College should carry out one of its original purposes to own a permanent home, a committee was appointed, July 20, 1829, to report on a permanent situation for the College. The attempt to secure a site from the Trustees of the University of Pennsylvania, on ground rent, of a lot on Seventh Street, above Market, having failed, the committee reported, on November 21, 1831, that "two sites for the purpose can be obtained, one site at the S. W. corner of Marble and Tenth Streets, running East and West between Market Street, containing a frontage of 38 feet on Tenth Street, and running to a depth of 60 feet, to a 6 foot wide alley, thus presenting a frontage on three sides. The price asked is $8,000. The whole extent of the lot is 96 feet on Tenth

Street, running back 92 feet, and the asking price is $20,000. As a matter of speculation, it would be profitable to purchase the whole lot, but in the opinion of your Committee it is too heavy a concern to enter into.

ZANE STREET BUILDING.
HOME OF THE COLLEGE, 1833-1868

"The second site is on the South side of Zane Street, adjoining Six's Sugar House, which is bounded on the West by at least a 10 foot alley, on the South by a vacant lot, which is to continue always opened, thus presenting three fronts, which is desirable on account of light. The lot is 30 feet on Zane Street (now Filbert

Street), running to a depth of 46 feet. The price asked is $200 per annum on irredeemable ground rent, or if redeemed in ten years such a capital sum as will produce $200 per annum, and in either case will expect $1000 for the buildings now on the lot, making a sum total of $4,333.33. It is the opinion of your Committee that this lot should be purchased, and no doubt Abraham Miller, the owner, will allow some reduction in the price of the buildings." The committee was authorized to offer Abraham Miller $225 per annum for the lot, the ground rent redeemable in twenty years, for the sum of $4,500, and the committee further authorized to obtain subscribers to a loan at 6 per cent. interest for the purpose of erecting a building on the said lot.

Abraham Miller, having accepted the above offer, the committee was directed to proceed with the erection of the building, and in 1833, the College erected a four-story building, with a frontage of 30 feet wide and a depth of 46 feet. The first and second stories were built with high ceilings for lecture rooms, in an amphitheater arrangement. This modest first home owned by the College was erected at a cost of $8,323.74.

STUDIES ON THE CASSABA AND HONEY DEW MELONS.*

By Heber W. Youngken, Ph.D.

During the late autumn and winter of recent years the writer has noticed in a few of the local markets two luscious fruits which dealers sold under the name of "Cassaba" and "Honey Dew Melons," or by the collective name of "Winter Melons." Their general external appearance indicated that they were fruits of the *Cucurbitaceæ,* but inquiry in the local market failed to elicit information as to their botanical origin and history. The only data procurable from this source was to the effect that they came from California and Colorado respectively, and were of excellent keeping quality.

The scant references to these melons in American and English works on horticulture were far from satisfying, and prompted this

* Read at meeting of Pennsylvania Pharmaceutical Association, Harrisburg, Pa., June 24, 1920.

investigation into their origin, history, structure and chemical constitution.

Both of these melons undoubtedly belong to the group which Bailey in his "Standard Cyclopedia of Horticulture" calls the *Inodorous* variety of *Cucumis melo.*

Cucumis melo, the progenitor of these forms, is a rough, hairy, annual herb which like many other plants of the gourd family is capable of clinging to supports and climbing, through the possession of tendril-bearing stems. The leaves are subcordate and palmately-lobed, the lobes being irregularly toothed. They arise from the stems in about the same plane as the tendrils. Both

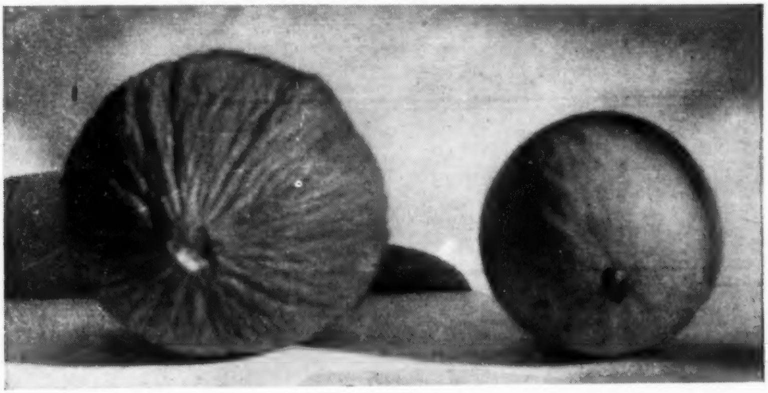


Fig. 1. End view of Cassaba and Honey Dew Melons. Cassaba to left. Honey Dew to right.

staminate and pistillate flowers are borne on the same plant, usually, but in some forms hermaphrodite flowers also occur. In all cases the flowers are axillary. The calyx is campanulate with a 5-toothed limb. The corolla is campanulate, 5-lobed, with lobes somewhat fringed. The 3 stamens with short, thick filaments are inserted at the base of the corolla. The gynoecium is composed of three syncarpous carpels, the ovarian portion being inferior and 3 celled, the style short and 3-fid. The ovules are numerous, several-seriate, horizontal and anatropus. The fruit is a pepo with numerous horizontal, compressed and ex-albuminous seeds.

According to Naudin,[1] who carried on investigation and experiments with about 2000 living plants, this species possesses an extraordinary number of varieties and breeds. The varieties, moreover, can be fertilized by each other and yield varied and variable

products. They are classed by him into ten groups which he terms: canteloups, melons, brodes, sucrins, melons d'hiver, serpents, forme de concombre, Chito, Dudain, rouges de Perse, and sauvages, each of these groups containing varieties or nearly allied races.

According to the same authority the species is indigenous to Southern Asia from the foot of the Himalayas to Cape Comorin.

De Candolle,[2] however, thinks that *Cucumis melo* like *Citrullus Colocynthis* was once wild from the west coast of Africa as far as India.

The Egytians grew it and the Romans and Greeks were at least familiar with some of its varieties.[3] Columella, of Gades, a contemporary of Seneca, an extensive writer on agriculture who flourished about the middle of the first century A. D., refers to a variety known as the serpent melon in the phrase *ut coluber . . . ventre cubat flexo*. Pliny in his writings refers to the melons as pepones.

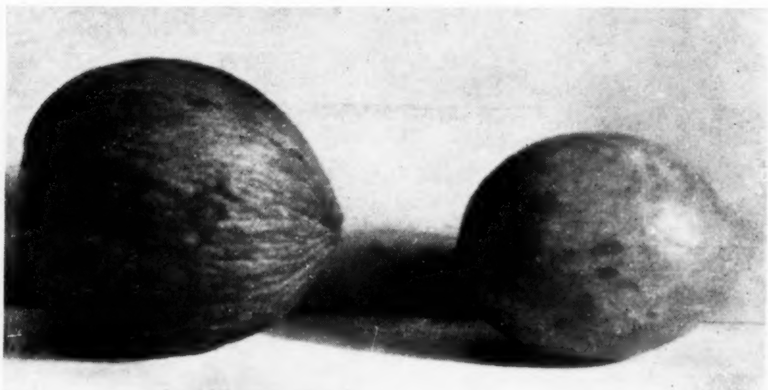


Fig. 2. Lateral aspect of Cassaba (to left) and Honey Dew (to right) Melons.

Its introduction into China appears to date from the eighth century.

In 1597, Gerard,[4] in his Herbal, described and figured several kinds of melons. But it was not until 1629, according to Oliver de Serres, that they began to be cultivated on a large scale in France.

Some of the valued modern types of the species, such as the Cantaloupes, Dudain, Pineapple Melons and Netted Melons had their origin in Persia and the neighboring Caucasian regions. From here they were introduced into the Mediterranean countries, not-

ably Asia Minor, Italy, France and Spain, whence their seeds were conveyed to this country.

The variety *inodorus*, which yields fruits known as winter melons, is said by Bailey [5] to differ from the wild species in having lighter colored, less hairy and narrower leaves, and little or none of the muskmelon odor which characterizes the fruit of the latter.

HISTORY OF THE CASSABA AND HONEY DEW MELON.

The Cassaba Melon, also termed "Kassaba," "Casaba," "Cassabad" and "Casba," was named from the town of Kassaba, about 15 or 20 miles from Smyrna where it was extensively grown and whence it was introduced to this country. Late in 1878 Dr. J. D. B. Stillman and James L. Flood, who found these melons in the hotels of Smyrna, sent seed to California. In the following year (1879) the first crop was grown in that state.

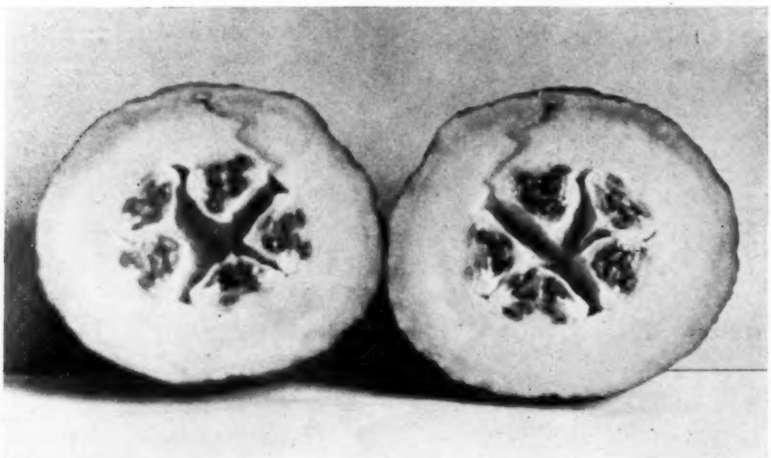


Fig. 3. Cassaba Melon cut crosswise to show internal appearance.

Hundreds of acres are now grown each year in the San Fernando valley of Southern California. They are shipped to the markets of this country mainly in October, November and December.

The Honey Dew Melon is an old South of France variety of the Winter Melon renamed. Vilmorin, of Paris, has listed it for a number of years under the name of the White Antibes Winter Melon. At the present time it is extensively grown in Colorado.

Dreer's Garden Book for 1919, p. 8, states that it is suitable for growing in all places of equal latitude to Philadelphia and the West, including California.

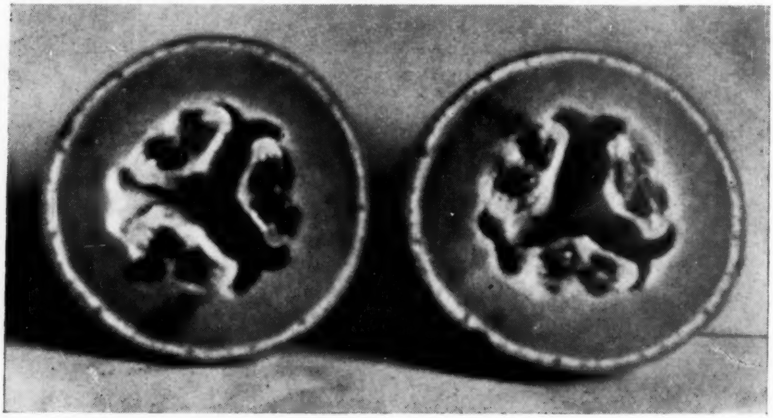


Fig. 4. Honey Dew Melon cut transversely to show internal appearance.

While both of these melons have been well known to and used by the Europeans for many years, they appear, up to the present, to be little known, and only of limited use in the United States. Their rich honey-like flavor, with far more succulence and longer keeping qualities than muskmelons should commend them to all seeking substitutes for cantaloupes and muskmelons during the autumn and winter season, and bid fair for their more extensive future production in this country.

GROSS STRUCTURE OF THE CASSABA MELON.

This fruit (Fig. 1) is of large broadly oval shape from 6, 8 to 9 inches long and 4 to 6 inches in thickness. Its outer skin is yellow and shows numerous irregular longitudinal grooves and wrinkles (Fig. 2). When cut (Fig. 3) it exhibits a thick, whitish flesh one and one-quarter to one and one-half inches thick and a comparatively small seed cavity. In the seed cavity are to be observed 5 placentas, each bearing numerous flattened, ovate light-yellow seeds 10-12 mm. long. The hilum is near the pointed end. The cotyledons are plano-convex, white and oily. The radicle is short and conical. The taste of the fruit is cantaloupe-like; that of the seed, bland.

HISTOLOGY OF THE CASSABA MELON.

This fruit, being the product of the ripening of the combined receptacle and inferior ovary, presents for microscopical examination two distinct regions, viz., pericarp (receptacle and ovarian wall) and seed.

PERICARP (FIG. 5).

1. The *pericarp* in surface view shows numerous for the most part polygonal cells, the vertical walls of which are considerably thickened. Scattered through this region are abundant stomata whose guard-cells are surrounded by 5 more or less crescent-shaped neighboring cells (Fig. 6). The walls of the stomatal apparatus are colorless. In transverse view the epicarp cells (Fig. 5), are palisade-like and form a layer up to 80 microns thick. The outer

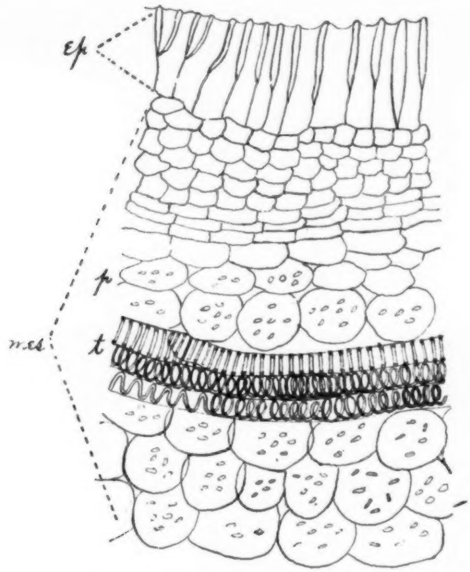


Fig. 5. Transverse section of portion of pericarp of Cassaba Melon. Epicarp with rod-thickenings in the radial walls (ep); mesocarp (mes); pitted parenchyma (p); spiral tracheae (t), (magnified).

half of most of the vertical walls of these cells is greatly thickened, while the inner half is for the most part thin walled. Occasionally thickening of the vertical wall extends nearly or quite the complete length of the cell.

A considerable number of uniserate non-glandular hairs, up to

243.2 microns in length are to be observed as outgrowths of the epicarp. Each of these (Fig. 7) is composed of 4-5 cells. The basal cell of the hair is characterized by an irregular thickening of its wall, while the distal cell shows a curved, sharp-pointed summit. Numerous circular scars are also evident in this region. (See Fig. 6A.) These represent the bases of the non-glandular hairs which have become detached. The epicarp cells bordering upon them are arranged in radiate fashion.

2. The *mesocarp* (Fig. 5 mes.) is composed of a matrix of fundamental parenchyma whose walls are characteristically pitted. The parenchyma cells are smallest in the outer regions, but gradually increase in size toward the endocarp. The intercellular-air-spaces are also the largest in the inner part of this region. Coursing through the mesocarp are numerous fibrovascular bundles of the bi-collateral type with prominent sieve tubes and spiral tracheae. The latter may attain a diameter of 25.66 microns. Accompanying the bundles, especially in the inner regions, will be observed numerous branching and anastomosing lacticiferous vessels.

3. The endocarp adheres to the seeds as a thin membrane.

SEED (FIG. 8).

1. *Spermoderm*, consisting of (1) a *palisade epidermis* (ep) with longitudinal ribs strengthening the radial walls. These are slender and unbranched and up to 156 microns in length. The cells of the

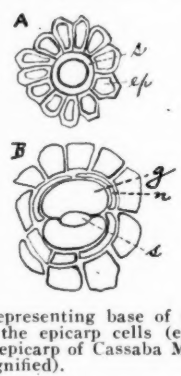


Fig. 6. A. Circular scar (s), representing base of non-glandular hair detached from epicarp of Cassaba Melon. Note the epicarp cells (ep) arranged around it in radiate fashion. B. Stomatal apparatus of epicarp of Cassaba Melon. Stoma (s); guard cells (g); neighboring cells (n), (greatly magnified).

epidermis contain a number of small spheroidal to angular starch grains. Upon coming in contact with water their outer walls, consisting of a mucilaginous modification of cellulose, are changed to mucilage.

2. *Sclerenchyma,* a zone of 3 to 4 layers rounded to ovate stone cells with radial pore canals. The inner layer of these cells becomes elongated toward and at the edges of the seed.

3. A zone of one or two layers of spherical to oval-shaped cells whose walls show reticulate markings.

4. A zone of about 4 layers of *spongy parenchyma* cells.

5. An inner epidermis of tangentially-elongated cells.

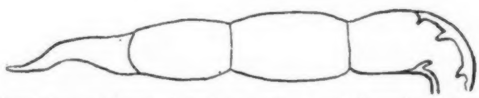


Fig. 7. Non-glandular trichome found on epicarp of Cassaba Melon (greatly magnified).

II. *Persiperm.* A prominent yellowish band (n) of tangentially-elongated cells, constituting the remains of the nucellus.

III. *Endosperm.* A layer of aleurone cells (al).

IV. *Embryo,* showing two plano-convex cotyledons and a small conical radicle toward the micropllar end of the seed. Each cotyledon (cot) in cross section shows an epidermis (e) of small clear cells, 2 to 3 layers of palisade cells (pal) (the broadest zone being toward the center), and several layers of spongy parenchyma (s). Sections cut through the center of the cotyledon show 3 fibrovascular strands coursing lengthwise through the spongy parenchyma. Both palisade and spongy parenchyma cells contain a large number of fixed oil droplets and aleurone grains 2 to 6.4 microns in diameter.

GROSS STRUCTURE OF THE HONEY DEW MELON.

This fruit (Figs. 1 and 2) is of large round to oval shape, from about 5 to 7 inches long and 4 to 5 inches in diameter. Its outer skin is hard, smooth and whitish. When cut, it exhibits a thick, greenish flesh (sarcocarp) up to one and one-quarter inches in thickness. The flesh is of a sweeter and richer flavor than that of the Cassaba melon. The seed cavity in the center differs from that of the Cassaba by showing only 3 placentæ (Fig. 4). Each of these bear numerous compressed ovate to ovate-lanceolate light yellow seeds 12 to 13 mm. long. These become shiny when placed in water, due to the formation of mucilage by the outer layer of cells of the seed coat. Other microscopic characteristics of the seed resemble those described under the Cassaba melon.

HISTOLOGY OF THE HONEY DEW MELON.

Alike with the fruit of the Cassaba, this melon presents for examination pericarp (ripened receptacle and ovarian wall) and seed regions.

PERICARP (FIG. 9).

1. The *epicarp* (ep.) in surface view shows for the most part polygonal cells which are strikingly similar in nature to those of the Cassaba melon. The stomata are likewise numerous, but their

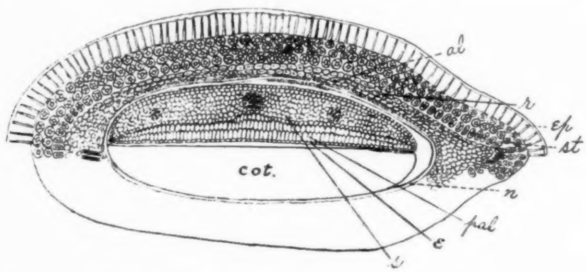


Fig. 8. Cross section of seed of Cassaba Melon (semi-diagrammatic), showing palisade epidermis (ep); sclerenchyma zone (st); reticulated parenchyma (r); perisperm (n); endosperm (al); cotyledons (cot); epidermis of cotyledon (e); palisade parenchyma (pal); and spongy parenchyma (s). Note the three strands of fibrovascular tissue extending through the spongy parenchyma region, as indicated by groups of circles (greatly magnified).

guard cells are surrounded by 6-8 irregular shaped neighboring cells. Circular scars of non-glandular hairs are to be observed in the mature fruit which have a diameter of from 35.2 microns to 41.6 microns with a lumen varying from 9.6 microns to 11.2 microns. In cross section the epicarp cells are found to be palisade-like, thickened along their radial walls for half or more of their length and up to 105 microns high. These cells possess numerous small rounded starch grains.

2 and 3. The *mesocarp* and *endocarp* are quite similar in structure to the same regions of the Cassaba Melon.

SEED (FIG. 11).

I. *Spermoderm,* consisting of (1) a palisade epidermis which readily separates from the subjacent layers upon coming in contact with water. These cells are 105 microns long and show longitudinal ribs strengthening the radial walls; (2) sclerenchyma, a zone of 2

to 4 layers of stone cells having thick walls that are pierced by numerous pore canals. In surface view these cells are elongated and show wavy walls which are perforated by distinct pores of an angular to rounded outline (Fig. 12).

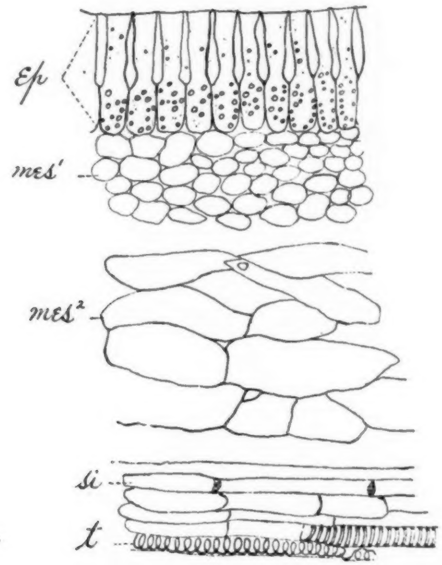


Fig. 9. Transverse section through representative portions of the pericarp of the Honey Dew Melon. Epicarp (ep); outer region of mesocarp showing parenchyma cells of ripened receptacle (mes¹); inner region of mesocarp, composed of parenchyma cells of ripened ovarian wall (mes²); sieve tubes (s) and spiral tracheae (t) of a bi-collateral bundle (greatly magnified).

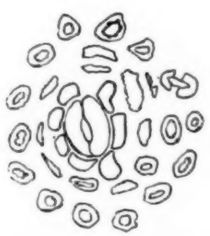


Fig. 10. Portion of surface section of epicarp of Honey Dew Melon. Note guard cells are surrounded by 7 irregular shaped neighboring cells. The regular epidermal cells are outside of these (highly magnified).

3. A layer of pitted cells (p).
4. One to two layers of reticulated parenchyma (r).
5. A layer of large parenchyma cells (l).

6. A narrow zone of collapsed spongy parenchyma.

7. An inner epidermis of thin-walled tangentially-elongated cells.

II. *Perisperm.* A distinct yellowish band of compressed cells (n).

III. *Endosperm.* A layer of aleurone cells (al.) with aleurone grains up to 6 microns in diameter.

IV. *Embryo.* Similar in structure to that of the Cassaba.

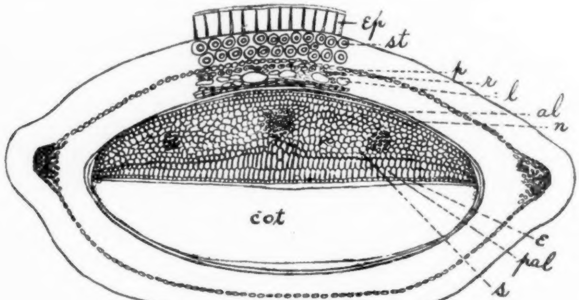


Fig. 11. Cross section of seed of Honey Dew Melon (semi-diagrammatic). Epidermis (ep); sclerenchyma zone (st); pitted cells (p); reticulated parenchyma (r); large parenchyma cells of spermoderm (l); perisperm (n); endosperm (al); cotyledons (cot); epidermis of cotyldon (e); palisade tissue (pal); spongy parenchyma with 3 fibrovascular strands (s), (magnified).

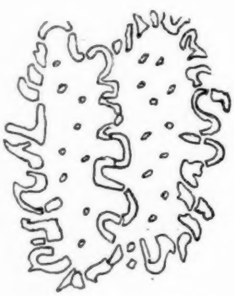


Fig. 12. Surface view of stone cells of spermoderm of Honey Dew Melon (greatly magnified).

CHEMISTRY OF FRUITS.

The following chemical analysis of the fruits was made by Prof. Charles H. La Wall and Mr. Joseph W. E. Harrison, to whom the author expresses grateful acknowledgment:

	Honey Dew Melon	Cassaba Melon
Total weight	1388.3 grams	3316.9 grams
Wt. of seeds and placenta	87. "	293. "
Wt. of rind	680. "	1360. "
Total refuse	767.4 "	1653. "
Amount of edible portion	45%	50%
Composition of pulp.		
Moisture	90.52%	89.05%
Ash	0.52%	0.80%
Crude fiber	0.36%	0.54%
Protein	0.51%	1.21%
Reducing sugar before inv.	2.05%	1.87%
" " after "	4.04%	2.76%
Fat	none	none

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2. Origin of Cultivated Plants, by De Candolle, p. 261, 1885.
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4. Herball, p. 772, 1597.
5. Standard Cyclopedia of Horticulture, 3rd ed., vol. 2, p. 908, 1919.

Botanical Research Laboratory.
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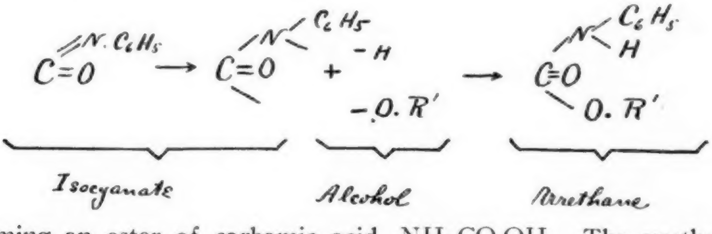
June 21, 1920.

URETHANES OF THYMOL AND CARVACROL.

By D. C. L. Sherk.

PHENYL URETHANES.

The preparation of urethanes is an addition reaction between an alcoholic hydroxyl and an isocyanate. The reaction takes place in this manner:



forming an ester of carbamic acid, $NH_2CO.OH$. The urethanes have been widely used in the characterization of hydroxyl derivatives, primary, secondary and tertiary.

The phenyl derivative of thymol was prepared by Leuckart [11] by the action of phenyl isocyanate on thymol in the presence of aluminum chloride. Hoffman [12] had first obtained these products by heating the isocyanate and phenol at 100° for long periods of time in sealed tubes. The yields varied from 16 to 64 per cent. The use of aluminum chloride was an improvement. Goldschmidt [13] first mentions the preparation of the phenyl derivative of carvacrol by the use of aluminum chloride and suggests its usefulness as a method of identification. Weehuizen [14] simply heats the constituents with the isocyanate in slight excess, together in a petroleum hydrocarbon boiling about 170-200°. The urethane crystallizes out; while the components not reacting remain dissolved. This modification of the method requires no condensing agent, and heating at the boiling point for one-half hour is all that is necessary to cause the reaction to take place. The phenol is dissolved in 10 parts of solvent; the isocyanate added in slight excess, and the mixture refluxed for one-half to one hour. The urethane crystallizes out on cooling and after filtering and washing with two small portions of the hydrocarbon it may be purified in the usual manner.

Application to Thymol.—An attempt was made to adapt the method to a somewhat larger scale of production than 1 gram. Accordingly, 5.28 g. of thymol with 4.6 g. phenyl isocyanate, representing a 10 per cent. excess, were introduced into an acetylation flask. The mixture became cold. To this were added 20 cc. petroleum (boiling 170-200°) and the mixture heated one hour. The cooled reaction mixture deposited crystals which were washed with two 5 cc. portions of petroleum and weighed. The yield was 6.75 g. or 71 per cent., with a melting point of 103°. Weehuizen [14] reports 106-107°; while the literature gives either 104° or 107° as the melting point. Crystallized once from alcohol (95 per cent.) it melts at 106°, a second crystallization raises this to 106.5-107°. It does not crystallize well from benzene on cooling, and does not precipitate on addition of heptane.

The determination of nitrogen by the Kjeldahl method pre-

[11] Leuckart, J., pr. Chemie, II, p. 320.

[12] Hoffmann, Ber., 4 (1871), p. 249.

[13] Goldschmidt, Ber., 26 (1893), p. 2086.

[14] Weehuizen, Rec. trav. Chim., 87 (1918), p. 266.

sented some difficulties. Direct digestion with potassium sulphate yielded only very uncertain results. Copper sulphate added as in IV gave even less satisfactory results.

I. 5.5464 g. required 22.63 cc N/10 HCl.
II. 0.5146 g. required 13.11 cc N/10 HCl.
III. 0.3696 g. required 11.72 cc N/10 HCl.
IV. 0.2934 g. required 0.99 cc N/10 HCl.

		Found	Theory for $C_{17}H_{19}NO_2$
			5.20 p. c.
Nitrogen	I.	5.80 p. c.	
	II.	3.35 "	
	III.	4.44 "	
	IV.	0.47 "	

On a basis of yield, method of preparation, and melting point determination the substance was certainly thymol phenyl urethane and the nitrogen determination was not checked by Dumas' method for this compound.

Application to Carvacrol.—5.04 g. carvacrol treated in the same was as thymol and run in parallel yielded 7.77 g. urethane, or 86 per cent. This melted originally at 134.5° to 136°. Crystallized from alcohol (95 per cent.) is melted at 138°. Further crystallization from alcohol did not raise this value. The hot benzene solution sets to a mush on cooling and the product melted at 133.5 to 134.5°. Addition of an equal volume of heptane to these mother-liquors gave a copious deposit of crystals melting this time at 138°.

It was found impossible to raise the melting point to 140°, as has been claimed by Gildemeister [15] for this substance; even though it had been treated with the following solvents: alcohol, dilute alcohol, benzene and heptane.

Analysis by the Kjeldahl method using potassium sulphate and also with copper sulphate as in IV gave unsatisfactory results.

In order to confirm the composition of these substances nitrogen was determined by the Dumas method.

I. 0.3054 g. yielded 14.9 cc nitrogen at 22° and 701 mm.
II. 0.2440 g. yielded 13.5 cc nitrogen at 24° and 703 mm.

	Found	Theory
I.	5.25 p. c.	5.20 p. c.
II.	5.53 "	

[15] Gildemeister, Arch. d. Pharm., 233 (1895), p. 188.

Application to Hydrothymoquinone.—Since hydroquinone[16] yields a diurethane, hydrothymoquinone was treated with two mols of phenyl isocyanate in slight excess and heated in petroleum, using 10 cc. per gram of phenol. The phenol melted on warning and gave a clear solution, which after about 15 minutes heating began to deposit crystals as spherules about 1 mm. in diameter. The cooled reaction mixture was filtered and refluxed again when a small quantity was recovered. For this preparation 2 grams of phenol were taken and the following recovery made:

Yield in grams	Per cent.	m. p.
4.765	81.6	229–230°
.095	1.6	210–220°

Another lot was prepared starting with 4 grams of phenol. When the isocyanate was added to this, reaction took place at once, even before dilution with petroleum or heating because a residue formed which later was found to be insoluble in the boiling reaction mixture. From this mixture 9.25 g. were recovered, representing a yield of 84 per cent.

These high yields indicate that both hydroxyl groups react and that a diurethane results. This is also wholly indifferent toward an alkali solution in the cold, indicating the absence of hydroxyl groups.

Analysis by the Kjeldahl method gave satisfactory results in this case.

I. 0.2936 g. required 15.24 cc N/10 HCl.
II. 0.3139 g. required 15.23 cc N/10 HCl.

		Found	Theory for $C_{24}H_{24}N_2O_4$
Nitrogen	I.	7.27 p. c.	6.93 p. c.
	II.	6.83 "	

However, to remove uncertainty as to the accuracy of this method, which seems to fail on the other urethanes, nitrogen was determined by Dumas' method.

I. 0.2302 g. gave 15.8 cc N_2 at 24° and 702 mm.

	Found	Theory
Nitrogen	7.36 p. c.	6.93 p. c.

[16] Snape, Ber., 18 (1885), p. 2429.

In sharp contrast with the solubility of the monoderivatives, the solubility of this product was slight. It is not soluble enough in benzene to allow this to be used for crystallization. In 95 per cent. alcohol it is slightly soluble in the hot and comes out as a fine powder. In ethyl acetate, chloroform, and carbon tetrachloride it is very slightly soluble; yet it separates in fine crystals from the acetate on cooling. Acetone dissolves it readily giving on evaparation hexagonal plates with one elongated axis. Ethyl acetate does not precipitate the acetone solution, while heptane does, and carbon tetrachloride gives a turbidity and a few crystals after warming.

For purification 14.0 g. of urethane were extracted under a reflux condenser with 190 cc. benzene for one hour. The residue was repeatedly extracted with 200 cc. 95 per cent. alcohol, crystallizing each time and repeating the extraction with the mother-liquor. After seven extractions 6.0 g. remained. This residue was extracted with 100 cc. ethyl acetate in the same manner three times, and finally the 4.0 g. remaining dissolved in acetone and recovered on evaporation.

Procedure	Turns brown	M. p.	Recovery	Total
Original	——	229–230°	——	14.0 g.
Benzene extraction	205°	213–216°	0.34 g.	
1st Alcohol	210°	229–229.5°	1.41	
2nd Alcohol	205°	226–227°		
3rd Alcohol	212°	227°	0.64	
4th Alcohol	200°	226.5–227.5°	0.69	
5th Alcohol	——	——	0.33	
Residue after this	210°	228–229.5°		
6th Alcohol	——	——	0.39	
7th Alcohol	——	——	0.58	
Remaining				5.93 g.
1st ethyl acetate	203°	224–226°	0.48	
2nd ethyl acetate	203°	225–228°	0.54	
3rd ethyl acetate	——	——	0.41	
Remaining				4.0

Melting Point of Re-crystallized Product.

Solvent	Turns brown	M. p.
Acetone 1st crop	223°	232–233°
Acetone 2nd crop	226°	232–233° gas evolved
Ethyl acetate, crystallized	223°	232–233°
Ethyl acetate, evaporated	220°	233°
Alcohol	213°	229–230.5° gas evolved

The product is thus practically pure as it separates from the reaction mixture. After extraction of the crystals with benzene to remove solvent they may be obtained pure by one crystallization from acetone or two from ethyl acetate.

α-NAPTHYL URETHANES.

In the extension of this work to the use of α-napthyl isocyanate as a reagent the method of Weehuizen was used. There is one mention of the preparation of the carvacrol derivative. The same procedure was followed as in the other cases, for the phenol and isocyanate were heated together with petroleum in an acetylation flask. The yields with this reagent were not so good. Perhaps a greater solubility in the petroleum accounts for this because after separation of one crop of crystals and reheating only a very little more came down. With phenyl isocyanate the intensity of the odor was a gauge of the completeness of the reaction, but that advantage was lost here. To conserve the reagent the phenols were taken in slight excess in these reactions.

Application to Thymol.—2.00 g. thymol and 1.65 g. isocyanate were heated with 15 cc petroleum for 45 minutes. On standing over night nothing crystallized out even on scratching the walls of the flask. It was again heated for one hour and fifty minutes after which crystals appeared on cooling. The crystals appeared as radiating clusters or spherules and weighed 1.34 g., melting at 155°. The first crop from alcohol came out as clusters of needles, melting at 156-157°; while a further quantity recovered by dilution of the alcohol melted at 149-150.5°. On long standing the reaction mixture deposited a slight crust on the walls of the container. The yield is 43.0 p. c. From alcohol it forms felted masses of needle-like crystals, melting at 156-157°.

After the reaction mixture had been heated again and allowed to stand four weeks, only a very thin crust of crystals on the walls of the flask appeared.

An analysis of this compound by the Kjeldahl method, using copper sulphate, gave unsatisfactory results. Analysis by Dumas' method gave results agreeing with the theory.

I. 0.2338 g. gave 10.9 cc N_2 at 24° and 708 mm.
II. 0.1919 g. gave 8.0 cc N_2 at 24° and 707 mm.
III. 0.1806 g. gave 7.4 cc N_2 at 27° and 706 mm.

		Found	Theory for $C_{21}H_{21}NO_2$
Nitrogen	I.	4.77 p. c.	4.39 p. c.
	II.	4.48 "	
	III.	4.30 "	

Application to Carvacrol.—2.05 g. phenol and 1.55 g. isocyanate were dissolved in 15 cc petroleum and heated exactly as for thymol with much the same results, except that after the last heating only a faint covering of crystals on the wall appeared. By cooling in a freezing mixture 1.05 g. of the crystals were recovered. After long standing the reaction mixture had only a thin covering on its walls. The yield is 35.9 p. c. on isocyanate used. The melting point of the original crystals was 114°. The first crop from alcohol melted at 117° to a turbid liquid, while the second crop obtained on dilution melted to clear liquid at 119°. It forms fine separate needles and felted masses.

Neuberg and Hirschberg[17] claim to have obtained a yield of 43 per cent. of a reaction product by heating carvacrol and the isocyanate together and allowing them to react. It was separated from the by-product di-α-naphthyl urea by filtration of the acetone solution. They obtained needles melting at 287-288°, when heated rapidly. The substance analyses correctly for nitrogen content as they found 4.82 p. c.; while the calculated is 4.39 p. c.. Their product decomposed on slow heating and even on keeping. The melting point of di-α-naphthyl urea was found to be 264°. In working up the slightly soluble portion of the reaction mixture from hydrothymoquinone, crystals were obtained melting at 266-270°, which were very likely the urea as they appeared also in the reagent itself when exposed to air, and melted at 264° from alcohol.

Analysis by the Kjeldahl method, using copper sulphate, gave results that were too high:

Analysis by Dumas' method gave value as recorded.

I. 0.2016 g. gave 8.2 cc N_2 at 26° and 708 mm.

		Found	Calculated for $C_{21}H_{21}NO_2$
Nitrogen	I.	4.36 p. c.	4.39 p. c.

[17] Neuberg and Hirschberg, Biochem. Zeit., 27 (1910), p. 343.

It thus becomes apparent that the substance which Neuberg and Hirschberg had obtained was not the α-naphthyl urethane of carvacrol but a decomposition product of α-napthyl isocyanate or a mixture which happened to yield a result for nitrogen about what they expected. The substituted urea obtained directly as a decomposition product of the isocyanate in the air melts at 264° or a little higher, the melting point of their urethane, but contains 8.98 per cent. nitrogen.

The carvacrol compound isolated here is similar to the thymol compound, perfectly stable, colorless needles or felted needles, and exactly similar to the phenyl urethane as regards these properties and soluble with practically the same characteristics. These four derivatives are strictly analogous and belong to the same type.

Application to Hydrothymoquinone.—By analogy with phenyl isocyanate α-naphthyl isocyanate should for the diurethane. The reagents were taken in that proportion: 2.26 g. isocyanate to 1.21 g. phenol, and boiled under a reflux with 20 cc. petroleum. The crystalline product never completely dissolved showing that some reaction took place on mixing the reagents. During heating a mixture of partially melted crystals deposited. This behavior is similar to that with phenyl isocyanate. The crystalline product recovered weighed 2.288 g. corresponding to a yield of 67.8 per cent. of the diurethane based on the isocyanate taken or 93.8 per cent. of the monourethane based on the phenol taken.

When plunged into a bath at 135° the substance melted to a turbid liquid, which cleared finally at 180°. After solution in alcohol, a slightly soluble portion crystallized out on cooling. This melted at 266-270° and corresponds to the urea obtained as a by-product.

In other particlars this reaction product revealed itself to be a mixture. Alcohol separated a slight amount of a crystalline product sufficient for an analysis and melting point. Its behavior toward solvents suggested a monoderivative. It formed white microscopic crystals from alcohol, melting at 147-148°, with softening at about 142°. Analysis gave the following:

I. 0.1343 g. gave 5.6 cc N_2 at 24° and 708 mm.

	Found	Calculated for $C_{21}H_{21}NO_3$
Nitrogen I.	4.50 p. c.	4.18 p. c.

An hydroxyl group is present because it dissolves in 5 per cent. sodium hydroxide with a slight color, and this deepens on standing or boiling. When carefully neutralized with hydrochloric acid it is precipitated out again.

The residue which melted at 266-270° was small in quantity and was known to be mixed with the urea derivative; so it is not known whether the diurethane forms under these conditions, or in what proportion it may be present.

Application to Hydrothymoquinone Dimethyl Ether.—The ether (2.0 g.) and phenyl isocyanate (2.4 g.) were boiled with 20 cc. of petroleum under a reflux for an hour. On cooling a few crystals appeared which were probably diphenyl urea. It was boiled another hour and nothing came out.

Leuckart [17a] discovered that thymol methyl ether reacts with

[17a] Leuckart, J. pr. Chemie, II, p. 320.

phenyl isocyanate in the presence of aluminum chloride. The resulting product is methylisopropyl methoxyl benzanilide.

Accordingly this reagent was added to the reaction mix ture. Warming to boiling initiates a spontaneous reaction, which keeps the mixture in gentle ebullition for a few minutes. The color did not change, but on heating crystals began to appear and a liquid distilled into the condenser which returned to the flask in drops, causing sputtering.

The product was filtered from the petroleum, decomposed with cold dilute hydrochloric acid and taken up in alcohol, in which it is as readily soluble and as easily recovered as the monourethanes. The color was discharged by boiling with bone black. After crystallization once from alcohol 1.5 g. were recovered. It melted at 240-241°. Re-crystallized, it melted at 240-241°, and treated with boneblack at 240° exactly. The crystals are white, appear as radiating clusters of needles and resemble, in solubility also, the monourethanes of thymol and carvacrol.

Upon digestion in sulphuric acid, it gave an oil which steam distilled at first but dissolved and cleared up completely in one and one-half hours.

I. 0.2984 g. required 29.11 cc N/10 HCl.
II. 0.3108 g. required 30.20 cc N/10 HCl.

		Found
Nitrogen	I.	13.67 p. c.
	II.	13.65 p. c.

[11a] Leuckart, J. pr. Chemie, II, p. 320.

The Dumas method gave results very close to these on material dried at 130° for one hour.

I. 0.1432 g. gave 19.6 cc N_2 at 22° and 705 mm.

	Found
Nitrogen	14.8 p. c.

A methoxyl determination gave no turbity in the silver nitrate solution after four hours; so there cannot be methoxyl groups present. This percentage of nitrogen does not correspond with any possible arrangement of the nuclei, because the isocyanate itself has only 11.77 per cent. nitrogen.

DIBENZOYL HYDROTHYMOQUINONE

The reaction by which this formed is the ordinary Schotten-Baumann reaction in which the phenol was dissolved in the theoretical quantity of 15 per cent. sodium hydroxide and a sufficient quantity of benzoyl chloride added to leave an odor at the end.

Five grams of hydrothymoquinone (3 mols) were dissolved in a slight excess (20 cc.) of 15 per cent. sodium hydroxide. To the brownish solution 8.4 g. of benzoyl chloride (6 mols) were added and the mixture shaken. Heat was evolved and a pale yellow, crystalline solid separated. The filtrate yielded some benzoic acid on acidification, but this may have been derived from the excess of alkali. The moist solid was washed at the pump and treated with about 40 cc. of 95 per cent. alcohol and boiled. A solution resulted, orange-yellow in color, which deposited crystals on cooling. These were taken up in alcohol and the undissolved portion from the first treatment also dissolved in this solution.

The crystals appeared as coarse needles, very slightly yellowish or as a finely granular white powder.

From dilute alcohol	(1st)	1.16 g.	mp. 138–140°.
From 95 p. c. alcohol	(2nd)	4.74 g.	mp. 141–142°.
From 95 p. c. alcohol	(3rd)	2.59 g.	mp. 141–142°.
Yield		8.49 g.	

On the basis of the dibenzoate, $C_{10}H_{12}(OCOC_6H_5)_2$, this represents a 75.5 per cent. yield, as computed only on that recovered from the alcohol by crystallization. On analysis:

0.2374 g. gave 0.6760 g. CO_2 and 0.1346 g. H_2O

	Found	Theory for $C_{24}H_{22}O_4$
C	77.7 p. c.	76.96 p. c.
H	6.3 "	5.93 "

Its melting point is very close to that of the original hydrothymoquinone; so tests were made to establish its identity. The hydroquinone dissolves slowly in 5 per cent. sodium hydroxide with a red-brown color. The dibenzoate was unacted upon during the same time. With a little thymoquinone, the hydroquinone in alcohol evaporated leaving a purple film and purple crystals. The dibenzoate evaporated, leaving yellow crystals of unchanged quinone, but no quinhydrone color at all. Finally a mixture of the two was melted along with the constituents on the same thermometer:

Hydrothymoquinone ....mp. 144–145°
Dibenzoate ....mp. 143–144°
Mixture ....mp. 123–125°

INDIRECT SERVICES OF PHARMACY AND PHARMACISTS.*

By E. G. Eberle, Ph.M.

PHILADELPHIA, PA.

This title has been chosen, not because it fits the paper throughout, but because a number of the references in it relate to such services. I hope you will not expect my feeble effort to entertain; it may not even present a formidable thought that can be applied with profit, and perhaps the brevity of the paper will please you most. However, there is a reason for the presentation, which has been prepared in response to a request by Dean LaWall, to say something on the occasion of a monthly Faculty meeting, and came just after looking over the report of the Convention of the American Pharmaceutical Association in New Orleans, in 1891. It impressed me with the indirect services rendered by pharmacy and pharmacists, and that which has been stated in many ways:—we receive by giving, and in real service both the giver and recipients share. In this way

*Read at the monthly meeting of the Faculty of the Philadelphia College of Pharmacy and Science.

the common fund of knowledge is created and we draw on this heritage while giving something thereto for others. Macaulay has stated this succinctly: "Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages." That is one of the points it is endeavored to bring out in this paper.

You assemble at these monthly meetings to exchange views on various subjects, to communicate the results of your observations, of comparing these and then to combine them or abstract from them for your profit and that of others. Your own worth is greater by observing the reception of your teachings and the application of them by the students, and their knowledge is more firmly fixed when observation accompanies their study and work.

The complexity or diversity of knowledge is illustrated in modern pharmacy—pharmacy is a science and an art, and as conducted in the United States, and almost every other country for that matter, is a business and profession. Quite naturally the American Pharmaceutical Association, which considers related matter in the programs of the annual meetings, is a representative organization of pharmacy, though some would have us think otherwise. There is an inter-relation of our work and investigations that have part in many lines of research. There is a branching from subjects that interest us into many industrial problems and promotions; some are of more importance to us, while others find far wider application elsewhere. That Herman Frasch worked in the laboratories of the Philadelphia College of Pharmacy under Professor John M. Maisch has its significance; the results of his later work concerned the world. Scheele's discoveries, while primarily for pharmacy, had a large part in the development of the chemical industries. When we think of Pasteur, his aid to medical and surgical practice impresses us, along with his achievements for silk culture, preservation of the grape culture of France, and industries in which knowledge of fermentation is greatly concerned.

When we study the system of training and education begun nearly one hundred years ago in the Philadelphia College of Pharmacy, we are made aware that this institution can be credited, in part, with the plan of vocational education in public schools, which the director of practical arts and vocational education in public

schools of Philadelphia said has been revolutionized in the last fifteen years. These are the words of Director Ash:

> "Where formerly the pupil went out from the school poorly equipped to make any real headway for some time in his chosen vocation, if he had one, and was forced to struggle along uninformed and unguided, he now goes out, as it were, with a flying start.
>
> "With the present system, the high school student, in the fourth year of his chosen course, spends two weeks out of every school month in an industrial establishment, actually working and producing, and earning a good salary.
>
> "In 1906 the vocational idea got a real foothold in the schools, and the amazing growth of this feature, both in interest of the pupils and effectiveness in the teaching, is now a matter of history."

The Philadelphia College of Apothecaries adopted the idea one hundred years ago and has successfully applied it in the system of teaching. It has aided thereby in the development of many industries. The apprentice system has practically disappeared, but the idea put into practice by these apothecaries in 1821, to co-ordinate education and training, remains and has been fitted and shaped into the scheme of the high schools a plan that has the advantages pointed out by Mr. Ash. You will reflect on the different Philadelphia industries, more or less closely connected with pharmacy, in the development of which P. C. P. graduates had a direct or indirect part

It has been truly said that the problem of education is much larger than the individual and his trade or profession, it is as big as society itself; the work of a profession, an institution, an organization, is measured not only by the results of and for those directly concerned but also by the influence on society or the world at large. Pharmacists have been more or less derelict in informing the public relative to their part in the world's work; the credit in which they should have shared has gone to others. Their work in associations is often belittled by their own number and not infrequently hindered and impeded, if the results are not absolutely neutralized or passed to the credit of others who are only too willing to utilize what has been done by pharmacists. Physicians link up their service with the life of citizens; chemists advertise their achievements, their value to the industries and commerce, while the contributions of pharmacy in that respect are often ignored and the credit then goes to others, because we do not contend for rightful

recognition, nor place sufficient value on our accomplishments and achievements.

Commerce of the past and present has been largely developed due to the search for drugs; the materia medica has been improved, and gives physicians assurance of results by undervalued—to some extent uncredited—study and investigations of pharmacists. Only recently a place was given in New York University Hall of Fame to another for the discovery of ether as an anesthetic that should have been accorded to the physician-pharmacist, Dr. Crawford W. Long. The research work of Dr. Edward Kremers and co-laborers has great possibilities; the investigations of Professor J. U. Lloyd have received rightful recognition and place in colloidal chemistry, but the record should be kept straight. An exploration in the interest of science has been made possible by H. K. Mulford Company, under the direction of Dr. H. H. Rusby, who has heretofore searched the wilds of South America, and with the purpose of serving humanity.

All of these preliminary references—many of them of very much greater import than the subject I have chosen—have the purpose of bringing in the main topic of the paper in which some of the connections of pharmacy with the industries are shown, and incidentally to point out wherein some of the annual meetings of the American Pharmaceutical Association afford opportunities for papers that will extend our knowledge and usefulness to the world. The thought is not new, but sometimes the opportunities for applying it are overlooked.

The paper referred to was presented by Charles Mohr, for about thirty years a member of the American Pharmaceutical Association, now deceased, a friend and correspondent of the late Professor John M. Maisch, on *Vegetation of Louisiana and Adjoining States.* The blending in this section of the country of southern and northern vegetation is sufficient inference that a large number and variety of plants were considered in his paper, comparatively few of them are of great medicinal importance, the greater portion dealt with the pines, in which the author was particularly interested, being employed by the United States Government to secure all available information thereto. He went somewhat into details of collection and yield of the turpentine, and also the manufacture of sugar from cane. Items of lesser importance were the citrus fruits, cam-

phor and fibre-producing plants. The interest of pharmacy in the more important items of the paper are relatively small, but the industries are largely concerned. Just now the high price of paper affects the cost of the Association's publication, and hence the discussions on the value of the pines for paper pulp attracted my attention; also the connection of pharmacists with this industry; further, the fact that as a new source of paper pulp cotton-stalks are now being utilized, and several pharmacists have been among the first to suggest the use of them for that purpose, and are preparing to manufacture from that source. Deductions of the discussions also are applicable to some of my preliminary statements, as will be seen. It was brought out that loblolly pine was suitable for making paper pulp, also the cotton-wood, and Joseph P. Barnum, member of the American Pharmaceutical Association, from Louisville, Ky., then interested in the manufacture from these sources, informed the members that a young lady, a graduate in pharmacy, had charge of their factory in Louisville.

The concluding remarks of Mr. Mohr evidence what has been stated, namely, that the one who contributes information profits, when he said in substance, that he was glad to have this information, of which he was entirely ignorant, being charged with the duty of bringing before the Government all that pertains to the pines, for the purpose of utilizing the wood to the greatest economical advantage, in fact all that relates to these woods; he thanked the members for the information he had received from them. It will be admitted that such papers increase the sum of our knowledge and add to our powers of direct usefulness, and may benefit the section of the country wherein the meeting of the Association is held.

The sources of paper pulp have been better developed elsewhere, and only in a limited way in the South; however, within the last month northern financiers have decided to increase the capacities of the paper pulp mills of the Great Southern Lumber Company, located in the section where this discussion before the American Pharmaceutical Association took place And, what is equally or more interesting, it is proposed to plant loblolly pine on cut-over lands, this wood growing to cutable size in fifteen years for wood paper pulp, so that by the time the standing timber is exhausted the new forest will be of good size. Immediate plans provide for an investment of eight million dollars, according to newspaper reports.

Another subject considered in Mr. Mohr's paper related to the manufacture of cane sugar. Recently manufacturers of products in which sugar is largely used have invested in sugar lands, with the purpose of raising cane and manufacturing sugar. A well-known Philadelphia pharmacist, Josiah C. Peacock, now engaged in other work, has been active along these lines.

The life and activities of Charles Mohr have a bearing on the title of this paper exemplifying by the work of one pharmacist the indirect services of pharmacy to industry and by his investigation added to the source of our knowledge. Therefore a running sketch is deemed of interest.

Charles Mohr was born in Germany in 1824. His father was engaged in chemical manufacturing, and several of his relatives were in one way or another associated with the Forestry Divisions. At the age of twenty-one he made his first exploring trip, which was to Northern South America in 1846, from whence, after a short stay, illness compelled his return home. In 1848 he came back to the United States, visited New York and Philadelphia, and thence went West, locating for a time in Cincinnati, where he became associated with a German manufacturer of chemicals. In 1849 he joined a party going to California, and on this journey lost his herbarium; and soon after coming to the mines was taken sick, and travelled on to San Francisco. In the meantime he had again made quite a large collection of plants.

He concluded to go to Panama. Soon after he arrived there he was attacked with fever and decided to return to the United States. While sick, his collection of plants was stolen. In December of 1850 he came back to Cincinnati, and from here settled on a farm in Clark County, Indiana. Farm labor not agreeing with him, he removed to Louisville and became assistant to an apothecary, in which firm he soon thereafter became a member. He then renewed his botanical studies with Leo Lesquereaux, taking up the mosses, which work was not published until in 1884.

On account of the condition of his health he travelled South to Louisiana, and thereafter to Vera Cruz, where he landed in the early part of 1857. There he engaged in pharmaceutical business, but on account of a revolution he was compelled to leave and returned to the United States, landing in Mobile, December 1857, and soon en-

gaged in the drug business there; this was continued until 1892, when he turned this business over to his son.

In 1860 he studied the ferns, and this work was published in Eaton's *Ferns of North America.* When the war between the States broke out he manufactured drugs from native resources. After the war, during the reconstruction period, he studied the fertilizing value of the ashes of various woods, and lectured throughout Alabama and wrote articles on this subject, in order to aid in the improvement of exhausted soils and betterment of agricultural practice.

In 1876 he was appointed to investigate the gold and other mineral resources of Alabama, which took him through all parts of the State and gave him the opportunity of studying the flora, which observations were published in Berney's *Handbook of Alabama* in 1878, under the title of "The Forests of Alabama and Their Products" and *The Grasses and Other Forage Plants of Alabama.* The value of his collection of minerals is shown by the fact that they were exhibited at the exhibition in Mobile in 1876, and also in Atlanta in 1881.

In 1887 he reported for the United States Department of Agriculture on the Economic Geology of Alabama. His treatise on Grasses and Forage Plants of Alabama was prepared for the United States Department of Agriculture in 1878 and 1879, and was also published in the *Botanical Gazette* for May, 1878, wherein he gave an account of the useful plants of foreign origin which were acclimated in the Gulf States. In 1878 he also began to arrange his herbarium of Alabama and prepare a preliminary list of plants growing there without cultivation. This was included in the Geological Survey of 1890, and later the plant life of Alabama was published.

In 1880 he was appointed to collect information for the Tenth Census Report on the Forestry Conditions in the Gulf States, and during this time he also collected for the Harvard Arboretum and for the Jessup Collection of the American Museum of Natural History. The latter was published in book form—*The Forest and Timber Trees of Alabama.* In 1882 he arranged the agricultural and forestry collection for the Department of Agriculture.

In 1883 and 1884 he was employed by the Louisville & Nashville Railroad to study the agricultural, forest and mineral resources along the line of its road. He also reported on soil and climate in

this territory. The collections made were placed on exhibition in New Orleans in 1884, and also at the Louisville Exposition, and a descriptive catalogue was published, under the title of "The Natural Resources of Alabama."

In 1892, as previously mentioned, he turned over the drug business in Mobile to his son, and devoted his time to plant life of Alabama and in the investigation of the flora of North America for the Division of Forestry, United States Department of Agriculture, and in arranging his herbarium of the plants of Alabama for the State University. A set of these plants is displayed in 150 glass front cases, showing the foliage, flowers and fruit of the forest trees, and the herbarium is known by his name.

His work on the pines was published in 1896, and then followed his monographs on the cypress, the juniper and red cedar. Monographs of the hard woods were to be published next, but he had just completed that on the oaks when he died in 1901.

In 1900, he moved to Asheville, N. C., where he spent most of his time in the preparation of the monographs mentioned. He completed *The Plant Life of Alabama,* but did not live to see the finished book, which came from the press a week or two after his demise. He was also preparing *The Economic Botany of Alabama,* in which were to be given full accounts of the useful and noxious plants of the State. This was to be the crowning work of his life. The Biltmore Herbarium and forests afforded him the opportunities for his studies. Here his last illness overtook him. Though suffering greatly for a number of days preceding his death, the last words he spoke, to be understood, were, "How beautiful the world is!"

PHARMACEUTICAL RESEARCH.*

By George M. Beringer, A.M., Ph.M.

The most ancient records available show that from time immemorial the progressive peoples of each period recognized that the preparation and dispensing of medicines was an important vocation to be entrusted only to those specially trained and educated to perform such duty to society. In ancient Egypt the priests of Isis alone

*Address delivered before the New York Branch of the American Pharmaceutical Association, January 10, 1921.

compounded and dispensed the prescriptions of the physician priests. The Israelites evidently held the apothecaries in high esteem, as the Biblical records contain a number of references to them and their work. The holy anointing oil and the incense were both directed to be "compounded after the art of the apothecary." To Eleazar of the priesthood, the son of Aaron, was entrusted the services and duties at that time performed by the apothecary. So we as pharmacists can take just pride in that we are engaged in a most ancient and honored calling.

The student of the history of pharmacy is soon brought to realize that pharmacy has played no small part in the world's progress and that pharmacists have made many valuable contributions to the knowledge of materia medica, botany, chemistry and the allied sciences, and that some of these, of the greatest benefit to mankind, are constantly employed in the professions and industries. He likewise becomes painfully aware of the fact that ofttimes the credit is given to, or taken by, other branches of science. The writers of Encyclopœdia articles and similar works of reference are specially faulty in their failure to recognize the importance of the contributions of the unobtrusive workers in science despite the services of incalculable value that these have rendered to mankind. To most of these authors and compilers the activities of the warrior, the statesman, or politician, so often destructive of the world's progress, and even of the novelist seem to be of paramount importance for perpetuation. Since the influence of pharmacy has been quite commonly overlooked by these general historians, it remains as one of the duties of pharmacists to see that the scattered data and facts concerning the lives and contributions of pharmacists are collected, preserved and published, so that it shall be established beyond peradventure as to whom credit is justly due.

Throughout the medieval period, and especially that portion which is referred to as the age of the alchemist, the contributions to the sciences were largely made by the investigators in medicine and the apothecaries who were aiming to improve the methods of preparing their remedies and of discovering new substances of therapeutic value.

Among the English-speaking nations there has been unfortunately a too apparent disposition to disparage the work of the apothecaries, and during the Fourteenth Century they were commonly re-

ferred to as the "physician's cook," and even in comparatively recent times, as the "physician's handmaids." It is apparent to the student of history that a relatively small percentage of medical practitioners have been engaged in actual research work, and that a goodly number of pharmacists have carried on research in behalf of pharmacy that will compare favorably with any that has emanated from the medical branch.

I cannot at this time delve too deeply into the debt of the world to pharmacy, for I conceive that a discussion of that topic would occupy the entire evening and preclude the consideration of the subject that has been assigned for this time. Nevertheless, it has such a close association with the subject of research that I cannot refrain from giving a few illustrations that must serve the purpose of the present occasion.

The study of the sciences undertaken by Davy as an apprentice to a surgeon-apothecary no doubt gave him his first insight into chemistry and determined the bent of his mind toward chemical research. The results of these investigations won for him reward and undying fame as the discoverer of a number of the important chemical elements.

That peerless indefatigable experimenter and ideal research worker, Karl Wilhelm Scheele, is constantly referred to as the great Swedish chemist, and his name is scarcely ever associated with pharmacy. Yet he studied pharmacy, and for the major part of his comparatively short life depended upon this calling for his livelihood. During the last eleven years of his life, he owned and managed a pharmacy, and was supported thereby while carrying on some of his most successful experiments. His activities and investigations cover a very wide range of topics of the utmost importance to mankind. The discoveries of Chlorine, Barium, Manganese and the investigations of its applications to the glass industry, of Tartaric Acid, Arseniuretted Hydrogen, his studies of the cyandides such as Prussian Blue and Hydrocyanic Acid, and of the composition of the atmosphere are but some of the contributions of this pharmacist to the world's progress. These can be traced largely to the contact with the wares and the problems of his chosen vocation. Who is prepared to estimate the world's indebtedness to this studious, observing and painstaking worker, many of whose discoveries are still in daily application in our industries?

Klaproth is another apothecary whose early investigations of the composition of pitchblende led him to the discovery of Uranium, and this was the initial step that has led up to the discovery of that remarkable group, the radio-active elements.

In the field of organic chemistry important contributions to our knowledge can be traced to pharmacists, and numerous are the illustrations available. I must here content myself with only citing for your attention the fundamental work of Sertürner, and of Pelletier and Caventou upon the alkaloids. The galaxy of brilliant investigations emanating from pharmacists who have engaged in research in this interesting domain covers nearly every civilized nation, and these have been of inestimable value in the practice of medicine.

Research is best defined as a careful search for the truth, and so it can be safely asserted that no authoritative work is accomplished, no scientific investigation or discovery is made, and no theory that is sound is propounded that is not based upon research.

Research is generally subdivided into that which is "pure" and that which is "applied." The distinction is made upon the basis of the latter being undertaken with a specific need in view and that the results will be applicable to the solving of some industrial and commercial problem usually of monetary advantage. Practical application is commonly the reason that actuates the establishing of research departments in most of our large industries. No one can take exception to this, as eventually the discoveries and inventions made are disseminated to the advantage of all. Yet there is a feeling held by the real scientists that personal interest should not blind one to the obligation of true citizenship, to contribute his full share toward public welfare and scientific progress.

Although the truly scientific and enthusiastic research worker engages in "pure research," possibly with the thought of clearing up some abstruse question that, while advancing our sum of human knowledge, may at the time have no apparent practical application, it happens ofttimes that his work and discoveries become of exceedingly great value and unexpected important application. The discoverer of the Herzian waves had no thought of the ulitarian value of his discovery and the later application thereof to wireless telegraphy. The investigation of our own Professor John Uri Lloyd on the subject of precipitates in fluidextracts was undertaken because the question was deemed a pharmaceutical problem of the time demand-

ing attention, and his publications were then considered simply from a pharmaceutical viewpoint. We are now proud of the association and the distinction awarded these by Dr. Wolfgang Ostwald as fundamental and important early studies in colloidal chemistry and to claim the credit for priority of publication in the proceedings in the American Pharmaceutical Association.

Recently we had the pleasure of listening to a lecture by Professor Edward Kremers, of the University of Wisconsin, in which he detailed the investigation carried on for upwards of twenty-five years on certain American species of Monarda. His studies of the aromatic principles and the other constituents of these plants, constitute an elaborate piece of pharmaceutical research that is destined to become a classic contribution to phyto-chemistry. While it may now be viewed as a pure scientific investigation, whose main value will be as a pioneer and in its suggestion for similar investigations directed to other groups of plants, it has cleared up a number of points relating to the source, composition and production of some of the important aromatic plant constituents, and I predict that it will prove of material assistance and pecuniary value to the industries engaged in preparing these on a commercial scale.

The history of Cinchona cultivation is an interesting narrative of scientific research applied to every phase of the subject. The selection of the species and varieties of Cinchona yielding alkaloids; the study of the alkaloidal content of the different barks; the problems of soil, climate, and altitude and their influence upon the character and percentage of alkaloidal content of the bark; the production of varieties yielding the largest percentage of Quinine; the study of the localization of the alkaloids in different parts of the plant, the effect of climate, season, etc., upon these and their transformation from amorphous to the crystalline state during the development of the plant organs; the discovery of the value of partial stripping, the best time for this operation, and the renewal of the bark by mossing; the modern methods of marketing the bark and alkaloids; the improved process of manufacturing the alkaloids in a high degree of purity; these are some of the problems that had to be worked out scientifically, and the value of the results from either a commercial or a humanitarian viewpoint is beyond calculation. It is a gigantic example of practical applied scientific researches. Notwithstanding all that has been accomplished by the study and scien-

tific investigation of the Cinchonas, the subject is not exhausted. The paper by Howard and Chick on "Some Recent Samples of Grey Cinchona Bark,"[1] demonstrates the necessity for a thorough re-investigation of the grey cinchonas of Peru to determine positively, by newly collected authentic specimens, the species yielding the bark containing the high percentage of cinchonine reported, and whether this was due to the altitude at which the trees grew. This paper presents the possibilities for duplicating the cultivation of the Ledgeriana variety of Cinchona Calisaya in which quinine almost alone is present to a high percentage by the cultivation of a selected Cinchona of the grey bark group for the production of cinchonine.

In addition to the classification of research as "pure" and "applied," I would advocate a further subdivision as especially applicable to pharmacy; namely, major and minor investigation in both pure and applied research. Every apothecary has opportunities from time to time to note improvements in formulas, methods of manipulation and niceties in compounding, what our friend Thomas McElhenie calls "wrinkles," These observations, although they may apear individually as comparatively insignificant, yet, if they be but suggestions for improvement, in the aggregate they will make toward a substantial advancement in the art of pharmacy. As a part of his collegeiate training and to inculcate the faculty of observation and deduction, every student in pharmacy should have assigned, some topic of pharmaceutic interest for special study, investigation and report, even though these subjects be but very elementary problems in pharmaceutic research.

Notable events have marked influence in stimulating the character of research and the results achieved. The foundation of a school of pharmacy in America for the systematic education of pharmacists had a decisive effect in the development of such characters as Daniel B. Smith and Dr. George B. Wood, and this event was the stimulus to which may be attributed the preparation of that master work the *Uinted States Dispensatory.*

The introduction of the process of displacement made the subject of percolation and the preparation of the various classes of galenicals by this method, topics demanding extensive experimentation, and as a result we have recorded the classical investigations

[1] *The Pharmaceutical Journal and Pharmacist,* July 24, 1920. Reprinted in THE AMERICAN JOURNAL OF PHARMACY, October, 1920.

of Procter, Squibb, Diehl, Lloyd and others as contributions of great practical worth to pharmacy.

The events of the Civil War presented new opportunities for pharmaceutical research and the further development of such pharmacists as Maisch and Squibb. The Southern States were compelled to rely much upon their natural resources. To meet this necessity Dr. Francis P. Porcher wrote his book on *The Resources of the Southern Fields and Forests, Medical, Economical and Agricultural,* and this work is still frequently referred to as an authority.

Dr. Charles Mohr, a southern pharmacist, likewise, made many valuable scientific investigations of the natural products and resources of several of the Southern States and his contributions to our literature are of great practical value to medicine and pharmacy as well as to botany.

The organizers of the American Pharmaceutical Association in 1852, had in mind as main purposes, the improvement of the quality of drugs imported and the better education and protection of pharmacists. The objects announced suggested research, and this organization has ever since been the nucleus around which has been gathered the principal research workers in pharmacy, and its publications have been the mediums for disseminating the far-reaching results.

The great World War forcefully demonstrated the necessity for co-ordinated scientific research, applicable to the industries as well as to modern warfare. As a war measure, the National Research Council was organized in 1916 primarily for the purpose of stimulating and co-ordinating research on war problems. In 1918, by executive order of the President of the United States, this was reorganized as a permanent body, and the announcement was officially made that "its essential purpose is the promotion of scientifc research and of the application and dissemination of scientific knowledge for the benefit of the national strength and well being." It is now chartered as the National Academy of Science. Despite the far-reaching possibilities and effects of pharmaceutical research and the importance to mankind of a thorough knowledge of all remedial substances, and that pharmacists are the logical persons for the carrying on of such investigations, it remains a fact that so far pharmacy has not been recognized in the plans of the National Research Council, and that there is no evidence that pharmaceutical research is to be given any encouragement.

The thorough study of the numerous medicinal products supplied by pharmacists, and the processes employed in securing and preparing medicines will open up boundless fields for study with innumerable research problems, the possibilities of which and the value thereof to mankind cannot be estimated. Suffice it to proclaim that "the sum of scientific knowledge for the benefit of the national strength and well being" acquired thereby, will hold no secondary place.

The practical issue at this time and an important question before American pharmacists is how pharmaceutical research can be systematized and organized so that the importance of co-operation of this branch of scientific investigation will be fully recognized, and an appropriate place in the scheme of the National Research Council be assigned to pharmacy.

The field open to pharmaceutical research is now not more restricted than formerly, but on the contrary, is continually expanding and it is but a fair inference to assert that the value of the past investigations can be more than duplicated by those of the future. There is no lack of opportunity for pharmacists to engage in study and research, and the present generation should not let the imputation rest that there is now less desire. An observing writer has recently stated that pharmacy has never been more in need of research upon strictly pharmaceutical problems than at the present time.

There is scarcely a topic associated with the practice of pharmacy on which the available knowledge can be said to be complete. Innumerable are the questions requiring further study arising from the natural kingdoms and all quarters of the globe from which medicines are obtained. The methods and processes employed in pharmacy are not yet sufficiently understood, and despite all the work done on percolation, and all that has been written thereon, the last word has not yet been spoken. The value of the various solvents and their appropriate use in the extraction of different drugs is still an open question, meriting further extensive investigations involving in each drug a study of its active constituents and their behavior to solvents "in situ" and after extraction. The revisions of our national standards, the Pharmacopœia and National Formulary, call for continuous research along many lines. The tests and assay processes are constantly undergoing revision and must be considered on the whole as tentative and requiring much further

review and improvement. The botanical source of some of the official vegetable drugs is still undetermined, even though these may have been in use for many generations. The proper time for collection of vegetable drugs and the approved methods for their preservation, drug plant cultivation, the effect of soil, climatic conditions, altitude, etc., the percentage of active constituents and the study of the localization of these in the respective plants remain fertile fields for study. The voluminous and excellent work of such men as Tschirch, Oesterle, Moeller, Dragendorff, Flückiger, Koch, Zörnig, Hanbury, Holmes, Greenish, Collin, Maisch, Kraemer, Bastin and Trimble in developing the knowledge of pharmacognosy and plant chemistry, but serves to demonstrate the vastness of the field yet unexplored. The enzymes; the ferments; the vitamines; the aninal organ drugs, such as the endocrine gland products; the synthetic chemicals; as well as the new remedies that are being continually introduced into medical practice, present an endless variety of topics demanding the attention and investigation of pharmacists. The text-books, and even the legally recognized official standards contain statements that are in need of verification and it is an imperative duty that these be critically examined and that each erroneous or misleading statement be either corrected or eliminated.

In citing these various lines of research open to pharmacy, it must be understood that I have offered these merely as examples and not as an enumeration of the extensive field of exploration available for the application of systematic pharmaceutical research.

The need is that pharmacists themselves, as well as scientists engaged in other fields of research, should have a correct view of the possibilities and the comprehensiveness of pharmaceutical research. The investigations properly coming under this classification have many points of contact with other fields of research, and therein is the need for co-ordination and co-operation, and the reason why pharmacy should be properly represented in any plans for national scientific research. The problems arising in the laboratory of the manufacturing pharmacist are, of course, important and should receive searching study and investigation, but not from a selfish standpoint alone. His problems can best be solved by co-operation not only with his fellow manufacturers, but by that of research workers in the sciences involved in the questions at issue, and the benefits of such research belong to "the national strength

and well being." However, to limit the pharmaceutical research to such a narrow field would be to have it serve only the selfish end of a few.

Many of the problems arising in pharmacy are of a chemical nature, but to limit pharmaceutical research to chemical problems would be a very narrow construction. Likewise, it is important that the pharmacologic action of synthetic remedies should be carefully studied and their therapeutic value accurately defined, but to limit the field of pharmaceutical research to such pharmacological investigation, as was at one time proposed, evidences a lack of conception of true pharmaceutical research and its proper scope. True, all of these and many more lines of scientific investigation are points of contact and co-operation of pharmacists with other research workers. Pharmaceutical research cannot, however, be classified with medicine, nor with chemistry or with any of the other lines of research so far recognized. Pharmacy performs a distinct duty to the public and should be accorded recognition as a distinct vocation with problems of national interest and welfare peculiar to its field of service. All of the propositions for pharmaceutical research that have so far emanated from those outside of pharmacy have only demonstrated the insufficiency of the view, and a failure to comprehend the extensive fields awaiting organized pharmaceutical research.

Pharmacists must themselves, have a proper conception of the present and a broad vision of the future possibilities. The salvation of pharmacy and its establishment upon a solid basis as a profession founded upon scientific studies and investigation, rests entirely upon the pharmacists themselves. The investigations of the past have been largely carried on by the individual workers engaged as teachers in the schools of pharmacy, or as experts in the laboratories of the manufacturers, and by a few retail pharmacists. There has been no systematic attempt to co-ordinate pharmaceutic research or make it a co-operative division of a national comprehensive research plan. Pharmacy has been like an ocean-going steamer with good engines and a compass, but no navigator.

We must now realize the changed condition of the times resulting partly from the war necessities, and partly from the advanced position assumed by those who have been placed in charge of the National Research Council. This organization is composed of

those associations or societies that have as a basis for membership research. Consequently, if pharmacy would seek a part in the scheme of this co-operative national movement, it must organize its research committee, association or section composed of research workers and those interests in pharmacy that are concerned in research, so that scientific pharmaceutic investigation will be stimulated and properly directed.

It would appear that the American Pharmaceutical Association is the proper body to organize pharmaceutical research that it may be assigned to its proper field of usefulness and correlated in the scheme of the National Research Council, and its Committee on Research is charged with this duty. The American Pharmaceutical Association is acknowledged to be the scientific support of the drug industries and the organization of research must now become another means of exhibiting its leadership and useful activity in behalf of pharmacy. It must hold aloft the torch of learning and transmit the knowledge acquired from the contributions of the past with increased brightness and added store and energy to the future generations.

Upon the Colleges of Pharmacy we must rely for support. Not only should their faculties be composed of enthusiastic research workers capable of carrying on scientific investigation, but every student in the higher or post-graduate courses should be given training in the original investigations of problems pharmaceutic. This is a feasible plan by which the work of the past can be perpetuated and the needed army of research workers in pharmacy may be gradually built up of the proper material.

In closing permit me to refer to the Biological Exploration of the Amazon Basin under Dr. H. H. Rusby. While the newspapers have very commonly spoken of this as an expedition of chemists, it is organized, controlled and financed by pharmacists, and to a very large degree it is a pharmaceutical research expedition, and is typical of many more extensive pieces of research that would become feasible under an organized pharmaceutical research endowment.

ABSTRACTED AND REPRINTED ARTICLES

NOTE ON THE KEEPING QUALITIES OF DRIED AND PULVERIZED VACCINE VIRUS.*

By Dr. O. Schöbl.

At the request of the Philippine Health Service, some experiments were made at the Bureau of Science in order to ascertain the method of preparation, and the means of preservation, of dried vaccine virus for practical purposes. The proper distribution of active virus to remote places has always been a problem in the Philippines, on account of geographical conditions, particularly in case of emergency—that is, when smallpox breaks out in a far-away place—because it takes a long time for the vaccine virus to reach its destination. Furthermore, we must take into consideration that there are localities in which there is no way of keeping the glycerinized vaccine virus at low temperature during shipment from the nearest port to these remote places.

It seems, therefore, that it is of great importance to the sanitary authorities of this country to try to distribute vaccine virus in such form that it can be kept even under unfavorable conditions; in other words, in a form in which even if direct light, and sun heat or artificial heat are excluded, the vaccine can still be kept for a reasonable length of time. Were this possible, vaccinations could be performed in the interior of islands where communication and ice plants are nonexistent. It would also benefit parts of the Islands which have both communication and ice, in as much as the health officer located in such places could keep on hand a certain amount of vaccine all the time, and if smallpox should break out in his district vaccinations could be commenced within three hours after receiving the report of the first case of the disease in the district. There are no doubt places connected with Manila, but where connection is such that, even if the health officer cable immediately for vaccine virus, several

*Reprinted from the *Philippine Journal of Science*, July, 1920.

days, and probably a week, must elapse before the required amount can reach him.

In looking over the literature on the subject, we find very few references. Apparently in most countries which have direct communication by land the vaccine virus preserved with glycerin is satisfactory for any occasion, and no further steps need be taken for the preservation of this important biologic product. In searching for data concerning the dried pulverized vaccine, we have to go back in the literature to 1881 to find the first note on the subject. Reissner in Darmstadt, and Frappoli in Italy, appear to have been the first ones to experiment with the drying of vaccine virus. It was at that time that the preservation of vaccine virus for wide distribution and shipping was desirable; but the glycerinized vaccine virus, as introduced by Muller about the same time, became supreme, and was so satisfactory that no further attempts were made to dry the vaccine virus. As far as the Philippine Islands is concerned, we find a note on the "Preservation of vaccine virus" by E. H. Ruediger in the Bulletin of the Manila Medical Society, August, 1910.

In preparing dried vaccine naturally three requirements have to be fulfilled. First, the drying must take place as rapidly and as completely as possible, and without the application of artificial heat. Second, the preservation must be such as to keep the powder in absolutely dry condition; it must be kept away from light, particularly sunshine, and from heat. Third, the bacterial content of the dried vaccine must be considered; in the absence of glycerin, which in the glycerinized vaccine acts not only as a preservative but also as a bactericide, the bacterial content in the dried vaccine will naturally be higher than in the glycerinized vaccine.

EXPERIMENTS PROPER.

The vaccine was prepared in the following way: The pulp obtained by scraping a vaccinated animal was ground up in a sterile mortar, spread over a large surface under aseptic conditions and dried rapidly over a hygroscopic chemical in vacuum, ground up, perfectly dried, and kept in a desiccator at room temperature. Every week one monkey was vaccinated with a small portion of this powder and kept under observation in order to ascertain whether or not there was any difference in the development of the "take" in this monkey and that of another one, used

as control, which had been inoculated at the same time but with fresh glycerinized vaccine. Up to date of writing, that is, four months from the time the vaccine was prepared (and it was kept at room temperature all the time), we have obtained in all inoculated animals first-class "takes" which could not be distinguished from the "take" in the control animal inoculated with fresh vaccine. We cannot, therefore, at the present writing state definitely how long the dried and pulverized vaccine will keep. But, in view of the fact that the experiments showed good results during the past four months, the procedure seems to be of practical use.

In order to make the use of this vaccine as simple as possible, we have suggested that it be put up in ordinary straight, one cubic centimeter, amber glass vials with rubber stoppers sealed with paraffin, another vial of the same type to contain the glycerin necessary to dissolve the powder immediately before use. The vial is opened by removing the rubber stopper. The glycerin is poured into the vial containing the powder. The rubber stopper is tightly replaced and the contents are shaken for several minutes until the powder has mixed with the liquid. This simple and convenient way of putting up the dried vaccine may not be the best as far as preservation of the dried vaccine is concerned; sufficient moisture may penetrate into the vial to render the vaccine virus inert in less time than four months. It was therefore suggested that, in case the above-mentioned method will not give satisfactory results, the powder be kept in hermetically sealed ampules, or be kept on hand in open bottles placed in a small dessicator containing a hygroscopic chemical.

Besides the experiments already mentioned, we have arranged a field experiment by shipping dried vaccine virus to various places in the Archipelago and back, and then testing its activity on monkeys by vaccination. The places to which dried vaccine was shipped and tested when returned to Manila are: Currimao, Ilocos Norte; Pandan, Ilocos Sur; San Antonio, Zambales; Calapan, Romblon, Pasacao, Culion, Surigao, and Butuan; Cagayan and Iligan; Oroquieta and Dapitan; Zamboanga, Jolo, Cotabato, Quinimi, Glan, Davao, Agutay, and Cuyo. The length of time necessary for shipping and reshipping was twenty-five days. The animals vaccinated with these dried vaccines showed first-class "takes."

The process of drying the vaccine pulp seems to decrease its bacterial content. In the experiments above mentioned the bac-

terial content decreased three hundred sixty times during the process of desiccating.

It is hoped that this preparation will help a good deal in overcoming some of the difficulties with which health officers meet in eradicating smallpox in the Philippines.

DR. GALLAGHER ON AVIAN TOXICOLOGY.*

Dr. Gallagher, of the Pathological Division, Bureau of Animal Industry, has recently conducted some very interesting researches upon the susceptibility of fowls to various toxic substances. He finds that fowls which weigh between 3 and 4 pounds exhibit about the same susceptibility to poisons as do medium sized dogs. Fowls are, however, more resistant to calomel, strychnine, and tartar emetic and are less resistant to phenol, salicylic acid, and potassium cyanide.

The resistance of fowls to strychnine is very remarkable. Gallagher reports that 2 grains of the sulphate administered to a 5-pound bird were not toxic while this amount was lethal when given to a 3½-pound fowl, all doses given per os.

Tartar emetic was lethal in 15 grain doses and toxic in 10 grain doses; 3 grains of mercuric chloride were non-toxic, 4 grains killed in 3 days; calomel was non-toxic in 30 grain doses; fluid extract of ipecac was non-toxic in 45 minim doses, toxic in one dram and lethal in 2 dram doses; 1 to 2 grains of potassium cyanide were lethal while toxic effects were produced by $\frac{1}{10}$ to $\frac{1}{2}$ grain. Potassium permanganate was lethal in 30 grain doses; salicylic acid was non-toxic in 15 grain, toxic in 30 grain, and lethal in 30 to 75 grain doses; 15 grains of santonin were non-toxic; 150 grains of sodium chloride was the toxic and lethal dose.

An interesting and important set of experiments revealed the facts that fowls are not visibly affected by drinking solutions of several remedies in the following concentrations: mercuric chloride, 1-6000, phenol 1-1000, potassium permanganate, 1-500 and crude catechu, 1-500, the solutions being furnished the birds for 18 to 21 days.

J. F. C.

* *J. Am. Vet. Med. Assn.* v. 54: pp. 337-56, 1919.

THE DIRECT IDENTIFICATION OF SOY-BEAN OIL.*

By Charles A. Newhall,

SEATTLE, WASHINGTON.

Oil chemists seem to have overlooked a valuble test for the direct identification of soy-bean oil. Two color tests attributed to L. Settini [1] have been found of value in detecting admixtures of soy-bean oil with other commercial oils.

For some three years the writer has been using a modification of the second test, as follows: Five c. c. of chloroform are added to 5 c. c. of the oil, mixed in a small test tube with a few drops of gum arabic solution and 5 c. c. of a 2 per cent. solution of uranium nitrate or uranium acetate, and shaken to form a thorough emulsion. All samples of crude and refined soy-bean oil so far examined give a characteristic lemon-yellow emulsion; whereas, no other oil so far tested gives this color.

The most valuable use for the test has been in detecting admixtures of the cheap bean oil with high-priced wood oil or with linseed oil. With the former the test is sharp, it being possible to detect as low as 5 per cent. of bean oil.

With linseed oil the test is not so sharp, as linseed oil mixtures always give a slightly brownish color. It has never been absolutely certain that the linseed oil samples used for comparison were pure, and further work is in progress.

With such oils as peanut, cotton seed, sesame, rape, and cocoanut, the test is very sharp, and these oils give white or slightly colored emulsions with the uranium salt.

The yellow emulsion is not formed with bleached and deodorized bean oil, hydrogenated oil, or bean oil fatty acid.

This Settini test for bean oil is not as sharp as some of the direct color tests characteristic of sesame or cotton seed oils, but nevertheless it has been of great value in the commercial testing of oils, arriving from the Orient. This is no indication that it will work equally well with domestic soy-bean oil. Since the yellow emulsion seems to be due to the presence of coloring matter

*From *Jour. Ind. & Engr. Chemistry,* Dec., 1920.

[1] *Chem. Abstr.* 7 (1913), 908.

in the crude oil rather than to some substance inherent to the oil, this coloring matter may be characteristic of only certain varieties of soy-bean. Until the exact nature of the yellow emulsion is cleared up, the Settini test should be used with caution, and its limitations taken into account.

FORMIC ACID IN THE BODY.*

One of the scientific consequences of the menaces to human health which have arisen from the alarmingly frequent cases of consumption of methyl alcohol, or wood spirits, has been the more careful study of the behavior of this toxic substance in the organism. Methyl alcohol, CH_3OH, is not completely burned up to simple end-products in the organism; one of the products of its metabolism is formic acid HCOOH, as Pohl [1] demonstrated many years ago. The excretion of formic acid thus becomes an indicator of the fact that methyl alcohol has been taken into the body.[2]

It would be a comparatively simple plan to examine the urine for the presence of formic acid whenever information is sought as to possible instances of poisoning with wood alcohol. It happens, however, that formic acid has been known for many years to occur in the urine of persons living under supposedly normal conditions. Autenrieth [3] found that the daily output may approximate 0.25 gm., so that, without a quantitative measurement of the formic acid in the urine, definite conclusions as to its source and origin could not be drawn. The mere test for the presence of formic acid will not suffice to point to methyl alcohol as its predecessor.

Substantiation of this general conclusion has now been afforded by Stepp [4] at the Medical Clinic in Giessen. He has detected formic acid as a frequently recurring if not ever-present

*From the *Jour. Amer. Med. Assoc.*, Dec. 4, 1920.

[1] *Pohl, J.: Arch. f. Exper. Path. u. Pharmakol*, 31: 286, 1895.

[2] *Methyl-Wood-Alcohol and Its End-products in the Body, editorial, J. A. M. A.*, 74: 33 (Jan. 3, 1920).

[3] *Autenrieth, W.: Ueber den Ameisensäuregehalt des Harns, normalerweise und nach Eingabe verschiedener Substanzen, München, med. Wochenschrift*, Aug. 1, 1920, p. 862.

[4] *Stepp, W.: Ueber den Befund von Ameisensäure im menschlichen Blute, Ztschr. f. physiol. Chem.*, 109: 99 (Mar. 1, 1920).

constituent of human blood. Fifty years ago the Berlin physiologic chemist, Salkowski,[5] reported the presence, in this fluid, of a substance that was identical in behavior with formic acid, but the observation received little if any further experimental consideration. Among the persons whose blood was examined by Stepp were several diabetics. These afforded the surprise of yielding negative results. Little if any formic acid could be detected in their blood, which gave evidence of pronounced hyperglycemia. As the destruction of sugar is profoundly disturbed in such cases, Stepp has offered the tentative suggestion that formic acid may be a stage in the usual metabolism of carbohydrates—a stage that might not be represented when the normal transformations of the latter are interfered with. Thus, the problem of the physiologic significance of the traces of formic acid, commonly present in both blood and urine of man, has become a by-product, so to speak, of the investigation of the toxicity of methyl alcohol.

CURRENT LITERATURE

SCIENTIFIC AND TECHNICAL ABSTRACTS.

Research on Antiseptics.—Richet describes personal research on different antiseptics, estimating their potency by their action on the lactic ferment in milk. The vitality and activity of the ferment can be measured easily and with precision, by the amount of lactose transformed, that is, of lactic acid produced. The most striking feature of the results was the amazing potency of extremely minute quantities of the antiseptics. Even as little as ten thousandths of a milligram to the liter is not without action. He recalls that the phenomena of fecundation and immunization occur with quantities so minute as to be beyond our measuring instruments. Another fact brought out by his research is that whenever an antiseptic (and probably also a drug taken internally), has proved successful, then is the moment to change to another. As soon as the bacteria have had their proliferation checked by the antiseptic, change to another will continue the checking work, while if the same antiseptic is con-

[5] *Salkowski: Virchows Arch. f. path. Anat.*, 50: 174, 1870.

tinued, the bacteria rapidly adapt themselves to it. He announces as a guiding principle for all therapeutics, "Quand une médication a bien réussi, il faut l'abandonner et en adopter une autre."

We have seven excellent antiseptics at our disposal, he says, and nothing is easier than to use a different one for each day in the week, from phenol, sodium hypochlorite, tincture of iodine, silver nitrate, sodium fluoride and creosote to hydrogen dioxide. Another phenomenon brought out by his experiments is the strange irregularity in the action of certain antiseptics. When the same amount of milk is placed in a number of different tubes to ferment and conditions are made apparently identical in each, there will be a considerable variation in the amount of lactic acid produced in the different tubes. Sodium fluoride is the most regular in this respect, the yield in lactic acid being almost the same in the whole set of tubes, while mercuric chloride sometimes exaggerates the fermentation and sometimes checks it completely. (From *Médecine, Paris;* through *Jour. Amer. Med. Assoc.*, Nov. 6, 1920.)

Biologic Test of Vitamins.—Schaeffer advises testing the food in question by adding it to the J. C. Drummond test diet for white rates or white mice. On this diet the animals grow thin and finally succumb in forty or fifty days, but the addition of even 5 per cent. of a vitamin-containing food arrests the decline, and the animals begin to thrive with a suddenness actually amazing. He adds that the avitaminosis of young infants is the most common of all and is the hardest to differentiate. By this simple biologic test of the food the infant is getting, we can tell at once whether it is suitable for the infant or not. The Drummond diet comprises 18 per cent. purified casein; 56 per cent. purified dextrin; 3.7 per cent. of a synthetic saline mixture, and 20 per cent. chemically pure twice recrystallized lactose, with 2.3 per cent. agar. (From *Medécine, Paris;* through *Jour. Amer. Med. Assoc.*, Nov. 6, 1920.)

Vitamins in Cooked Carrots and Navy Beans.—Miller states that cooking carrots at 100 C. for thirty minutes caused no reduction in the vitamin. Neither was there any destruction when carrots were packed tightly in a jar and heated at 115 C. for forty-five minutes. Cooking navy beans at 120 C. for thirty minutes de-

creased the vitamin content 40.6 per cent. In this case the beans were somewhat overcooked. Cooking navy beans in 0.5 per cent. sodium bicarbonate solution for 1 hour and 10 minutes caused a loss of 37.5 per cent. of the vitamin. A large proportion of the vitamin, from 36 to 70 per cent., was present in the cooking water. (From *Jour. Biological Chemistry, Baltimore,* through *Jour. Amer. Med. Assoc.*, Nov. 13, 1920.)

New Method of Estimating Quinine.—(C. Bamberger—*Pharm. Zentralb.*, 1920, 61, 257-259; through *Chem. Zeit.*, 1920, 44, Rep. 223.)—Two and a half grms. of cinchona bark are heated for ten minutes over the water-bath with two c. c. of hydrochloric acid and 20 c. c. of water, and the mixture then cooled, shaken with 25 grms. of chloroform and 50 grms. of ether, and treated with 5 grms. of sodium hydroxide solution. The contents of the flask are vigorously shaken (about 300 times) within two to three minutes, and treated with sufficient plaster of Paris (about 40 to 50 grms.) to clarify the liquid, and 60 grms. of the clear chloroform-ether layer transferred to a separating funnel. It is shaken twice (for two minutes each time) with 5 c. c. of $\frac{N}{10}$ hydrochloric acid and twice with 10 c. c. of water, and the extracts united and titrated with $\frac{N}{10}$ potassium hydroxide solution, methyl red being used as indicator. The results agree closely with those obtained with the Swiss Pharmacopœia method, and the methods of Frerichs and Mannheim. (From *The Analyst,* November, 1920.)

Determination of the Jellying Power of Gelatins and Glues by the Polarimeter.—C. R. Smith (*J. Ind. and Eng. Chem.*, 1920, 12, 879).—The optical rotation of solutions of all gelatins and glues at 35° C. is practically constant, ranging from—6.70 to 7.20° Ventzke per grm. of solid material, but on cooling to 15° C. the rotation increases proportionately to the viscosity of the solution. Increase in concentration gives higher values, but by keeping the solutions for several hours at 15° C. a gradual decrease is observed, so that solutions of all strengths under the above working conditions yield a constant rotational value for any

particular sample. Determinations of the polarimetric values are made by soaking 3 grms. of the powdered air-dried gelatin in cold water for 30 minutes, immersing in a boiling water bath until solution is complete, cooling to 35° C. and diluting to 100 c. c. If clarification is necessary, 5 grms. of light magnesium carbonate are added to the solution, which is kept at 30-40° C. for an hour, and filtered bright. The first rotation is measured in a 200 mm. tube at 35° C., the solution then being kept at 15° C. over night, and the rotation again observed next day. The results are expressed by the formula $\frac{\text{Rotation at } 15^\circ}{\text{Rotation at } 35^\circ}$, and are inversely proportional to the percentage of gelatin required to produce a standard jelly at 15° C. This standard is defined as a solution of such strength that a bubble of air 4 to 5 mm. diameter admitted to the polarimeter tube moves vertically with a motion of 4 cm. per second. Two tables are provided, giving a large number of results obtained, and a third one showing the comparison between the polarimetric values and jelly strengths obtained in the following manner: A 60° funnel is partly filled with mercury, 50 c. c. of the gelatin solution are poured upon the surface, and allowed to set at 10° C. The mercury is then run out, and a partial vacuum of 600 mm. of water produced below the jelly, when the depression of the upper surface is measured by a micrometer gauge. The results obtained by this method bear a moderately definite ratio to those given by the polarimetric method. (From *The Analyst,* November, 1920.)

Poisonous Properties of Yew.—There can be no doubt about the poisonous properties of the yew; all parts of the plant but the arillus have been shown to be poisonous. Yew has caused the death of many horses and cattle, while asses, mules, deer, pigs, rabbits, and pheasants have also been poisoned. In "Plants Poisonous to Live Stock," by H. C. Long, the question is dealt with at considerable length, and while the author produces much evidence against the plant, he reminds us that many cases have been recorded in which fatal results have not followed the ingestion of the leaves, for it appears that the lower branches of yew trees in parks are constantly cropped by cattle without ill-effects. The old leaves or shoots are mentioned as being the most poisonous parts. Eaten by an

animal on a full stomach a small quantity of yew may cause little or no dangerous results. The poisonous principle is generally considered to be taxine, an alkaloid having the composition $C_7H_{52}NO_{10}$. It is a question, however, whether it is the *only* poisonous constituent. The yew is irritant and narcotic, and the poison is not cumulative, but, on the other hand, rapidly effective, so that animals may die apparently suddenly, no previous symptoms having been observed. In an interesting illustrated article entitled "Poisonous Berries," by E. M. Holmes, F. L. S.; which appeared in the P. J. of November 20, 1915, page 638, it is shown under what conditions the leaves or fruit may be poisonous or not. (From *The Pharm. Jour. and Pharmacist,* Sept. 4, 1920.)

POISONING BY FLUORIN COMPOUNDS.—Kockel and Zimmerman report two cases of poisoning from hydrofluoric acid. The clinical picture was characterized by marked physical weakness and frequent vomiting. The course of the intoxication was very rapid, covering not much more than two hours before the fatal issue. One case was traced to rat poison and is regarded as a suicide; the other was a criminal poisoning case. (From *Munchener medizinische Wochenschrift, Munich,* through *Jour. Amer. Med. Assoc.,* Nov. 6, 1920.)

MEDICAL AND PHARMACEUTICAL NOTES

URSONE IN ERICACEOUS PLANTS.—The author has examined a number of plants belonging to the natural order Ericaceæ for ursone and found it in all of them; hence he concludes that it is of general occurrence in Ericaceæ. The best method of isolating it is that of Dodge (*Jour. Amer. Chem. Soc.,* 40, p. 12). It was identified by ultimate analysis and also by the following color reactions: (1) With sulphuric acid it gives an orange-yellow liquid with a green fluorescence; (2) a little dissolved in 2 c. c. of acetic anhydride gives with 8 or 10 drops of sulphuric acid a red coloration passing to violet, green, and blue; (3) a little dissolved in chloroform, and shaken with an equal volume of sulphuric acid, colors the latter yellow. Ursone was also found in holly, maté, and the leaves of two other species of *Ilex.* It crystallizes in white needles, melting at 273°. One gm. is soluble in 178 gms. of ethyl

alcohol, 88 of methyl alcohol, 388 chloroform, 1675 of carbon disulphide, 192 of ethylene bromide, 140 of ether, and 35 of boiling alcohol. Optical rotation $[a]^{13}_{D} = 58°$. It can be titrated with alkalies as well as with acids. The formula is $C_{29}H_{47}O.\ COOH, 2H_2O$. It yields a readily crystalliable methyl ester. (From *Pharm. Weekblad,* vol. 57, p. 1128, through *The Pharm. Jour. and Pharmacist,* Oct. 30, 1920.)

Staining Reticulated Cells.—Permanent preparations are made by Cunningham by combining a vital with a Wright's stain. The reticulation is as clear, if not clearer, than by the older methods, and the Wright's stain retains all its differential qualities, except the polychromatophilia, which is not present. The ease and simplicity of this method brings the study of reticulated erythocytes within the scope of routine blood examination. A small drop of a 0.3 or 0.5 per cent. aqueous or alcoholic solution of brilliant cresyl blue is placed on the end of a clean slide or the center of a cover glass and smeared around over an area 1.5 cm. in diameter. Next, a drop of fresh blood is placed on a clean coverslip and dropping it face down on one of the areas of dried stain. The stain goes into solution almost instantly. The cover glasses, or slide and cover glass, are now pulled apart as in making an ordinary blood smear and are permitted to dry. On drying, the blood turns a dirty greenish blue color. The slide or cover glass is then stained with Wright's blood stain. The preparation is dried in the usual manner and mounted with Canada balsam. The reticulum is stained a deep or light blue, depending on its density, and gives a striking picture in its contrast with the pink protoplasm of the cell. (From *Archives of Internal Medicine, Chicago,* through *Jour. Amer. Med. Assoc.,* Nov. 13, 1920.)